PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Edward M. MOLL

Application Serial No.: 08/835,625	Group Art Unit: 2736
Filed: April 9, 1997	Examiner: J. Tweel, Jr.
Attorney Docket No.: M1043/20006	Confirmation No.: 5281

For: THOUGHT CONTROLLED SYSTEM

AMENDED APPELLANT'S BRIEF PURSUANT TO 37 CFR§1.192

Mail Stop Appeal Brief-Patents
Commissioner for Patents
Board of Patent Appeals & Interferences
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This amended appeal brief is being timely filed, under the provisions of 37 CFR §1.192, in response to the Notice of Non-Compliant Appeal Brief dated March 2, 2009 and the Board of Patent Appeals and Interferences' Order Returning Undocketed Appeal to Examiner dated February 18, 2009. The required fee for a small entity set forth in 37 CFR §1.17(c) was previously paid when the original Appeal Brief was filed on November 15, 2005 so no appeal brief fee is due. However, if any fee is deemed required, this acts as authorization for the PTO to debit the undersigned's firm debit account 03-0075 for all required fees, and any and all extension of time fees.

1. REAL PARTY IN INTEREST

Edward M. Moll is the real party in interest regarding the above-identified application.

2. RELATED APPEALS AND INTERFERENCES

An appeal was previously filed in this application on February 2, 2001 and for which the Board of Patent Appeals and Interferences rendered a decision (Appeal No. 2002-1635, Paper No. 31) on March 31, 2004. See Related Proceedings Appendix accompanying this brief. The appellant's legal representative in that appeal was the same as the law firm of the undersigned, namely, Customer No. 03000.

3. STATUS OF CLAIMS

Claims 1-2, 4, 9, 12, 15, 17-18, 21, 38, 40, 44-45, 51,55 and 67-70 are pending in this application. These claims were rejected in a Final Office Action dated June 15, 2005. Claims 3, 5-8, 10-11, 13-14, 16, 20, 22-37, 49, 41-43, 46-50, 52-54 and 56-66 were previously canceled.

Claims 1-2, 4, 9, 12, 15, 17-18, 21, 38, 40, 44-45, 51, 55 and 67-70 are being appealed, and a copy of these claims is included in the Claims Appendix accompanying this brief.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Final Office Action dated June 15, 2005.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The subject invention is for controlling a computer by thoughts in the brain. For example, where a user, coupled to the invention, thinks the thought of "print the document", or "copy the file", or "delete the file," etc., the invention detects the particular user stimuli that is generated by that specific thought and then operates the computer accordingly. Thus, the present invention is controlling the computer in accordance with the user thought and does *not* use biofeedback to manipulate any virtual pointer, cursor, etc. that appears in the operating system as

displayed on the computer screen. It (the thought controlled system (TCS), hereinafter "The present invention") is primarily concerned with finding the radiating properties of the brain or results thereof and selectively applying these findings to the control of computerized devices. The primary mode disclosed accomplishes its purpose by accepting Magnetic Source Imaging (MSI) findings of the human body and selectively applying these findings to the control of other devices. A.S.N. 08/835,625 (hereinafter "'625 application), p. 16, lines 2-7.

Claim 1 specifies this invention by calling for an apparatus that controls a computer based on one or more stimuli from at least one user thought (p. 16, lines 11-13) wherein the apparatus comprises: (a) stimuli input means (see "Stimuli Detection and Conditioning (SDC)", 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines 17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 40, lines 11-15; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;) coupled to the user for detecting at least one stimulus being caused by the at least one thought of the user; (b) a computer having an operating system, (see "Thought Controlled Computer (TCC)", 100 in Fig. 1; p. 19, lines 5-14; p. 21, lines 10-13; p. 22, lines 4-8; p. 22, line 17-p. 25, line 15; p. 27 lines 10-12; p. 30, line 17; p. 41, lines 19-22; p. 42, lines 17-20;) coupled to the stimuli input means, for processing the at least one stimulus to produce a function control signal (see "Function Control" 307 in Fig. 3; p. 41, lines 13-15;) to control the operation of the computer wherein the computer does not require an articulated response from the user (e.g., the user does not have to type in a response, or speak, etc.); and wherein the computer comprises (b)(1) function selection means ("Function Selection", 304 in Fig. 3; p. 41, lines 11-15;) for receiving the at least one stimulus and wherein the function selection means comprises a memory including a

correspondence between a plurality of previously-stored user stimuli (p. 19, lines 11-12) and a plurality of desired control signals; and (b)(2) identification means ("Identification", 306 in Fig. 3; p. 41, lines 10-15;), coupled to the function selection means, for comparing the at least one stimulus to the correspondence to identify a function control signal corresponding to the at least one stimulus (p. 41, lines 10-14; p. 42, lines 1-5), and wherein the function control signal is transmitted to the operating system of the computer.

In particular, the present invention utilizes the fact that biomagnetic potentials at particular precise locations in the brain of the user are found to be consistent with a particular *thought* of the user. For example, in accordance with Walter et al.,[1] the *thoughts* of "moving the foot", or "moving the thumb," or "moving the index finger" generate particular stimuli at precise locations in the person's brain. Thus, *the detection of particular stimuli corresponding to a particular thought* is known in the art. The present invention utilizes this relationship to then make an association of these particular stimuli of deliberate user *thoughts* with a user-desired control function which is then implemented as explained in Figs. 1-3 and pp.19-46 of the present application in order to control a computer. As an example, the '625 application states:

> ...Each stimulus or group of stimuli is identified with a unique designation so that the user can associate stimuli with his or her (related) thoughts. TCS provides for designations of the user's choice to be displayed or otherwise communicated to the user. For example, TCS may display related predetermined pictures or the brain pictorially with the location of each stimulus received. The user may choose a display of the entire brain or a part thereof. The user makes the final choice as to which designation will identify which of the stimulus, or group of stimuli, is used to evoke a particular function of the computer. This information is recorded in the stimuli profile... ('625 application, p. 30, lines 1-9).

[1]Walter et al. "Individual Somatotopy of Primary Sensorimotor Cortex Revealed by Intermodal Matching of MEG, PET, and MRI" Brain Opography, 1992, Vol. 5, No. 2, p. 186, Table 1.

This operation is shown in Fig. 3 and is discussed in the Specification at pages 40-41. In particular, the user desires a certain computer control (e.g., print a document) by thinking the thought, e.g., "move the index finger"[2]. The stimuli detection and conditioning 101 detects the particular stimuli in the user's brain that correspond to "moving the index finger" (which is the "designation" that corresponds to printing a document). The pre-stored stimuli[3] associated with that designation is passed from the designation 305 to the function selection 304 where that particular designation ("moving the index finger") is associated with the control function "print a document". The particular stimuli in the user's brain is compared, in the identification 306, with the pre-stored stimuli from the function selection 304. If there is a match, then the identification 306 generates the function control signal 307 "print a document" and the computer then prints a document.

Claim 2 further specifies that the stimuli input means comprises magnetic source imaging (MSI) means which is discussed throughout the Specification.[4] As stated on page 16 of the Specification,

> MSI has the ability to pinpoint spatial distribution of a magnetic field or stimulus. Used to display a visual image of the source of the location, it may assist the user in relating thought patterns to results obtained. MSI is noninvasive can utilize stimuli from internal parts of the brain remote from the surface. This is more

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[2]Initially, the designations are those thoughts whose stimuli can be easily and reliably detected on repeated basis. For example, as discussed on p. 27, line 6-17 of the '625 application, user stimuli generated by the motor section of the brain (e.g.,"move index finger"), the sense of smell section of the brain (e.g.,"smell of a gardenia), movement of the eye portion of the brain, etc., all of these generate very specific stimuli that can be detected on a repeatable basis.

[3]Initially, the present invention is trained to associate a user desired designation with a control function. For example, when the user thinks about "moving an index finger", the present invention detects the stimuli that are active when the user thinks about moving the index finger and associates that with the control function "print a document." As a result, the user can accomplish particular computer control by thinking a particular designation.

[4]'625 application: p. 4, lines 1to p. 9, line 7; p. 16, lines 4-8; p. 19, lines 9, 17, 20; p. 44, line 5; and p. 46, line 3.

> advantageous than EEG and EKG requiring surface electrodes or methods requiring invasive procedures. ('625 application, p. 17, lines 4-8).

Thus, although not the only example of stimuli input means, MSI is the preferred type of stimuli input means because of this ability to pinpoint spatial distribution of a magnetic field or stimulus that are active when a particular thought of the user is occurring.

Claim 4 specifies the present invention as further comprising auxiliary stimuli input means ("Auxiliary Systems 104 in Fig. 1) for supplementing the stimuli input means 101. As stated on pp. 20-21, the auxiliary systems 104 provide means for contributing alternate or additional inputs to the present invention (e.g., noise, voice recognition, illumination condition, movement of other body parts, etc.)[5].

Claim 9 specifies that the present invention may further comprise communicating means for communicating information about the user's thoughts. As stated on p. 20 of the '625 application, the auxiliary stimuli detection 105 provides custom or standard interface to make communication possible between the TCC 100 and stimuli monitoring equipment as needed to augment the stimuli input means 101.

Claim 12 specifies that the present invention may further comprise designating means (designating 305 in Fig. 3) which was described earlier regarding the association of user-detected stimuli that can be easily and repeatably detected.

Claim 15 specifies that the stimuli input means includes means for conditioning the at least one stimulus for use by the TCC 100.[6]

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[5]'625 application, p. 20, lines 15-20.

[6]'625 application, p. 23, lines 6-22 to p. 24, lines 1-2.

Claim 17 specifies that the TCC 100 further comprises a database for storing inaccuracies regarding the correspondence between the plurality of previously-stored user stimuli and the plurality of desired function control signals. As discussed in the Specification,[7] the recording 207 receives inputs of incomplete conclusions which are related to involuntary thoughts to improve the ability of the present invention to more accurately detect user stimuli.

Claim 18 specifies that the present invention further comprises respective databases for storing user unique stimuli for other users and wherein such unique stimuli can be used by the computer for security or identification of users. In particular, a portion of the recording 207 (Fig. 2) establishes a database for each user and identification of the user can be achieved.[8]

Claim 21 specifies stimuli selection means that select stimuli based on acceptance criteria formed by previously-stored user stimuli. In particular, the stimuli selection 204 criteria is defined in terms of signal strength and correlation factor with other entries[9].

Claim 38 specifies means for detecting coactive stimuli for increasing the dependability of the function selection means. In particular, where two stimuli sources are found to be associated and always coactive, the uniqueness of this stimuli will provide increased dependability. One example of multi-location stimuli occurring is the interpretation of sound occurring at multiple places in the brain where sound source direction and message content are determined separately[10].

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[7]'625 application, p. 35, lines 1-7.

[8]'625 application, p. 39, lines 13-17.

[9]'625 application, p. 28, lines 16-17.

[10]'625 application, p. 31, lines 8-12.

Claim 40 specifies means for detecting sequential stimuli for increasing the dependability of the function selection means. In particular, two sequential thought signals, rather than one, is required in order to avoid errors[11].

Claim 44 specifies localization means for identifying locations in the user of the source of the at least one stimulus. In particular, this means, e.g., magnetic source imaging (MSI) is discussed in detail on p. 3, line 20 to p. 7, line 5 and pp. 27-28 of the '625 application.

Claim 45 specifies an adaptive means such that the present invention localization means can adapt to a change of location of the source of the at least one stimulus whenever the user moves. In particular, where the user moves his head, the need to reliably detect the particular stimuli of the deliberate thought requires that the localization means operate without being affected by the user head movement.[12]

Claim 51 specifies bodily communication means for coupling to the user, or within the user, for providing a communication path for the at least one stimulus between the user's brain and a body part of the user that is being controlled. In particular, the bodily communication means forms a "gap-bridger" between the user's brain and the body part (e.g., arm or leg muscle) that may be paralyzed[13].

Claim 55 is directed to the present invention that includes: (1) a detecting means for detecting one or more stimuli sensed from one or more thoughts of the user (see "Stimuli Detection and Conditioning (SDC)", 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines

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[11]'625 application, p. 30, lines 18-19.

[12]'625 application, p. 24, lines 3-18.

[13]'625 application, p. 41, line 16 to p. 42, line 16.

17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;); (2) selecting means (see "Function Selection", 304 in Fig. 3; p. 41, lines 11-15) for receiving one or more of the detected stimuli and then selecting a correspondence to one or more user stimuli to a selected function and which does not require an articulated response from the user (e.g., the user does not have to type in a response, or speak, etc.); (3) identification means (see "Identification", 306, in Fig. 3; p. 41, lines 10-15;) for identifying one or more of the detected stimuli as corresponding to the selected function for producing a function control signal; and (4) receiving means ("Computer Operation", 301, in Fig. 3; p. 41, lines 13-15;) for receiving the function control signal to control the computer.

Claim 67 is directed to the present in the present invention that includes: (1) stimuli input means ("Stimuli Detection and Conditioning (SDC)" 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines 17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;) for detecting at least one stimulus caused by at least one thought *pattern*[14] of the user; (2) a computer ("Thought Controlled Computer (TCC)", 100 in Fig. 1; p. 19, lines 5-14; p. 21, lines 10-13; p. 22, line 17-p. 25, lines 1-15; p. 27 lines 10-12; p. 30, line 17; p. 41, lines 19-22; p. 42, lines 17-20;), coupled to the stimuli input means, including an operating system ("Computer Operation", 201 in Fig. 2; p. 22, lines 4-8;) that processes the at least one stimulus to produce a function control signal ("Function Control Signal" 307 in Fig. 3; p. 41, lines 13-15) to control the computer and wherein the computer does not require an articulated response from the

[14] '625 application, p. 19, line 11.

user (e.g., the user does not have to type in a response, or speak, etc.) and wherein the computer further comprises: (a) function selection means ("Function Selection" 304, in Fig. 3; p. 41, lines 11-15) for receiving the at least one stimulus and wherein the function selection means comprises a memory that includes a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals; (b) identification means ("Identification" 306 in Fig. 3; p. 41, lines 10-15;), coupled to the function selection means, for comparing the at least one stimulus to the correspondence to identify a function control signal corresponding to the at least one stimulus (p. 41, lines 10-14; p. 42, lines 1-5) and wherein the function control signal is transmitted to the operating system of the computer.

Claim 68 is directed to the present invention that includes: (1) detecting means ("Stimuli Detection and Conditioning (SDC)" 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines 17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;) for detecting one or more stimuli caused by *one or more thought patterns in the user's body*; (2) a selecting means (see "Function Selection", 304 in Fig. 3; p. 41, lines 11-15) for receiving one or more of the detected stimuli and then selecting a correspondence to one or more user *thought patterns* to a selected function and which does not require an articulated response from the user (e.g., the user does not have to type in a response, or speak, etc.); (3) identification means (see "Identification", 306, in Fig. 3; p. 41, lines 10-15) for identifying one or more of the detected stimuli as corresponding to the selected function for producing a function control signal; and (4) receiving means ("Computer Operation", 301, in Fig. 3; p. 41, lines 13-15;) for receiving the function control signal to control the computer.

Claim 69 is directed to the present invention that includes: (1) stimuli input means ("Stimuli Detection and Conditioning (SDC)" 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines 17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;) for detecting one or more stimuli caused by at least one user thought *category*[15]; (2) a computer ("Thought Controlled Computer (TCC)", 100 in Fig. 1; p. 19, lines 5-14; p. 21, lines 10-13; p. 22, line 17-p. 25, lines 1-15; p. 27 lines 10-12; p. 30, line 17; p. 41, lines 19-22; p. 42, lines 17-20;), coupled to the stimuli input means, including an operating system ("Computer Operation", 201 in Fig. 2; p. 22, lines 4-8;) that processes the at least one stimulus to produce a function control signal ("Function Control Signal" 307 in Fig. 3; p. 41, lines 13-15;) to control the computer and wherein the computer does not require an articulated response from the user (e.g., the user does not have to type in a response, or speak, etc.) and wherein the computer further comprises: (a) function selection means ("Function Selection" 304, in Fig. 3; p. 41, lines 11-15;) for receiving the at least one stimulus and wherein the function selection means comprises a memory that includes a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals; (b) identification means ("Identification" 306 in Fig. 3; p. 41, lines 10-15;), coupled to the function selection means, for comparing the at least one stimulus to the correspondence to identify a function control signal corresponding to the at least one stimulus (p. 41, lines 10-14; p. 42, lines 1-5) and wherein the function control signal is transmitted to the operating system of the computer.

[15] '625 application, p. 27, line 8.

Claim 70 is directed to the present invention that includes: (1) detecting means ("Stimuli Detection and Conditioning (SDC)" 101 in Fig. 1; p. 19, lines 8-22; p. 20, lines 1-14; p. 22, lines 17-p. 25, line 13; p. 26 lines 4-15; p. 28, lines 1-7; p. 32, line 22-p. 33, line 10; p. 34, lines 6-11; p. 35, lines 1-10; and lines 19-22; p. 41, lines 19-22; p. 42, lines 6-16; p. 44, lines 3-5;) for detecting one or more stimuli caused by *one or more thought categories in the user's body*; (2) a selecting means (see "Function Selection", 304 in Fig. 3; p. 41, lines 11-15;) for receiving one or more of the detected stimuli and then selecting a correspondence to one or more user *thought categories* to a selected function and which does not require an articulated response from the user (e.g., the user does not have to type in a response, or speak, etc.); (3) identification means (see "Identification", 306, in Fig. 3; p. 41, lines 10-15;) for identifying one or more of the detected stimuli as corresponding to the selected function for producing a function control signal; and (4) receiving means ("Computer Operation", 301, in Fig. 3; p. 41, lines 13-15;) for receiving the function control signal to control the computer.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 are unpatentable under 35 U.S.C. §103(a) based on U.S. Patent No. 5,474,082 (Junker, hereinafter "Junker") in view of the publication "The Other 90% Technologies Inc. Breaks Through the Thought Barrier with MindDrive," by Mark Smotroff (hereinafter "Smotroff").

2. Whether Claim 2 is unpatentable under 35 U.S.C. §103(a) over Junker in view of Smotroff and further in view of U.S. Patent No. 5,594,849 (Kuc et al., hereinafter "Kuc").

3. Whether Claim 18 is unpatentable under 35 U.S.C. §103(a) over Junker in view of Smotroff and further in view of U.S. Patent No. 4,949,726 (Hartzell et al., hereinafter

"Hartzell").

4. Whether Claims 44-45 are unpatentable under 35 U.S.C. §103(a) over Junker in view of Smotroff and further in view of U.S. Patent No. 5,325,133 (Adachi, hereinafter "Adachi")

GROUPING OF CLAIMS

Claims 1, 55 and 67-70 do not stand or fall together because they are separately patentable for the reasons set forth in the "Argument" section below. However, Claims 67-70 do stand or fall together.

Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51 do stand and fall together. Claims 44-45 do stand and fall together.

7. ARGUMENT

Claim 1 is separately patentable from Claim 55 and from Claims 67-70 because the invention claimed therein is directed to an apparatus that detects one or more stimuli caused by at least one thought of the user and from that, in combination with a function selection means and identification means of a computer, controls the computer operation. Claim 55 is directed to a different apparatus that detects one or more stimuli caused by thoughts in the user's body and from that, in combination with a selecting means, identification means and receiving means of a computer, controls the computer operation. Claims 67-70 are directed to a different apparatus that detects at least one stimulus caused by the thought pattern of a user, or thought category of the user, and from that, in combination with a function selection means and identification means, or in combination with a selecting means, identification means and receiving means, of a computer, controls the computer operation.

I (a). THE EXAMINER ERRED IN CONCLUDING THAT JUNKER SHOWS ALL THE ELEMENTS OF CLAIMS 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 EXCEPT FOR THE IDENTIFICATION MEANS

In the Final Office Action dated June 15, 2005, the Examiner finally rejected Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 under 35 U.S.C. §103(a) asserting that Junker provides all the elements of Claim 1 except for the identification means. To make up for that deficiency, the Examiner cites Smotroff. With particular regard to Junker, the Examiner states that:

> For claim 1, the apparatus for controlling a computer operation based on at least one stimulus sensed from a user taught by **Junker** includes the following claimed subject matter, as noted, 1) the claimed stimuli input means is met by the electrodes (No. 22) coupled to the user (No. 10) for detecting at least one stimulus being caused by the thought of the user, 2) the claimed computer having an operating system is met by the control system (No. 29) having an operating system (No. 31) for processing said at least one stimulus to produce a function control signal to control the operation of the operating system without requiring the user to manipulate the user controls, 3) ***the claimed function selection means comprising a memory is met by the data store (No. 19) in which multiple brain-body signals are stored with each sample from the user.*** However, as for the identification means there is no evidence that the stimuli are compared to stored stimuli to identify a corresponding control function for a computer. Junker does store previous stimuli in connection with control functions and upon sensing stimuli uses this stored data to perform the control. The specific comparison is not set forth in Junker. (Emphasis added, Final Office Action dated June 15, 2005, pp. 2-3).

However, Junker does ***not*** disclose the function selection means and the Board of Patent Appeals and Interferences concurred with that determination in Appeal No. 2002-1635 when the Board stated:

> ...Appellant argues at page 17 et seq. of the brief that **the function selection means and** the identification means **are not taught or suggested by Junker**. We agree with appellant, and do not find that the examiner has shown where or how Junker teaches **these claim limitations**...(Emphasis added, pp. 5-6 of Decision on Appeal dated March 31, 2004).

When the Board's concurrence was brought to the Examiner's attention, his only response was the following:

> Even if the Applicant's assumption were correct, the current rejection is based on a combination of references that the Board of Appeals and Interferences has decidedly not concurred or even reviewed. (Final Office Action dated June 15, 2005, p. 14).

It should be remembered that the Examiner is asserting Smotroff only for the teaching of an identification means that is missing from Junker; however, the Examiner **is still relying on Junker** as teaching **a function selection means** in contravention of the Board's determination. By failing to teach or suggest the function selection means, Junker in combination with Smotroff still does **not** present a prima facie case of obviousness. As a result, Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 are patentable over the art of record and the §103(a) rejection should be withdrawn.

I(b). THE EXAMINER ERRED IN ASSERTING THAT SMOTROFF TEACHES OR SUGGESTS THE IDENTIFICATION MEANS SPECIFIED IN THE PRESENT INVENTION

The Examiner asserts that Junker teaches all the elements of Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 except for the identification means. To make up for that deficiency, the Examiner cites Smotroff as disclosing the identification means[16] and asserts that it would be obvious to one skilled in the art to combine Smotroff with Junker to arrive at the invention specified in Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70. In particular, the Examiner states that:

> The "mind-control" software described in the Smotroff reference is a software program that enables a user to control a computer program using a figure-mounted sensor that monitors heart, temperature, blood-pressure volume, and electrical activity in the brain and transmits that information to an interface that plugs into a PC-compatible computer, which analyzes the data it receives and translates it into computer signals. The MindDrive software recognizes the distinctive signals produced by different mental activity. This is plain evidence that signals have been recognized by computer software and translated into information that the computer can recognize. Logically, the computer

[16]Pp. 16-24 of Appellant's Brief, filed February 2, 2001.

> for later reference stores these stimuli patterns and the control functions are enacted based on the previously observed stimulus.
>
> The system taught by Smotroff introduces a type of link between brain activity and computer control. This type of control is similar to the primary reference in that Junker also uses the sensing of brain activity to control a computer. The Smotroff reference compares brain stimuli to stored stimuli and performs the corresponding function. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate storing the data as computer functions similar to MindDrive for the purpose of utilizing a standard operating system that easily recognizes different input for different computer control. (Emphasis added, Final Office Action dated June 15, 2005, p. 3).

Smotroff (see the Evidence Appendix accompanying this brief) is simply a one page product announcement for unveiling and promoting the MindDrive computer game, i.e., MindSkier. It should be known that Applicant previously made the MindDrive computer game of record in the original Information Disclosure Statement filed on June 19, 1997 ("Mind Reading-Fact or Fiction"), along with U.S. Patent No. 5,016,213 (Dilts, et al., which is cited on the MindDrive literature and a copy of which is attached in the Evidence Appendix accompanying this brief), and which the Examiner did consider on November 18, 1997[17]. Moreover, **Applicant distinguished the present invention from both the MindDrive computer game and U.S. Patent No. 5,016,213 (Dilts, et al.) in the Background of the Invention of the present application**[18]. Thus, not only does Smotroff **not** provide any scientific

[17]Office Action, dated December 2, 1997.

[18]Another reference that is related to controlling a computer based on user physiology is U.S. Patent No. 5,016,213 (Dilts et al.) which discloses a method and apparatus for controlling the position of an image on the screen of a computer using galvanic skin response (GSR), also known as Psycho galvanic reflex (PGR) or electrodermal reflex (EDR). In particular, the system teaches the introduction of a GSR amplifier circuit that couples to the game paddle port of a conventional computer, e.g., an Apple II computer. The GSR amplifier circuit is contained within a housing having GSR contacts that are located on the exterior of the housing for the user. When the user applies a finger to the GSR contacts, the GSR amplifier circuit utilizes the skin resistance available at the GSR contacts to create an electrical signal that changes in sense and amplitude directly with changes in the resistance sensed between the GSR electrodes. Furthermore, there is a product sold under the mark MINDRIVE™, by The Other 90% Technologies, Inc.™ of San Rafael, CA 94912-2669 which is believed to include a number of the features disclosed in U.S. Patent No. 5,016,213 that is available for use with home computers. Among other things,

basis or any operational theory to make up for any deficiency in Junker regarding an identification means[19], as suggested by the Examiner, **but detailed literature that is directed to the MindDrive computer game, namely, U.S. Patent No. 5,016,213 (Dilts, et al.) has already been distinguished from the present invention**. Thus, it follows that if a more detailed description of the MindDrive computer game, i.e., U.S. Patent No. 5,016,213 (Dilts, et al.), can be distinguished from the present invention, then certainly a one page product announcement, Smotroff, that lacks such detail, by definition, is also distinguished from the present invention.

The Examiner's response to Applicant's arguments are the following:

> Just because the Applicant cited the Smotroff reference in an earlier Information Disclosure Statement and the Background cites the Dilts patent does not make it any less of a relevant reference, especially when properly combined with the prior art above...(Final Office Action dated June 15, 2005, p.14);
>
> The Examiner has not relied on the Dilts reference for any of the rejections above. Still, the Junker reference plainly recites storing digital brain-body signals in a memory store (No. 19). (Final Office Action dated June 15, 2005, p. 15).

The only reason that Applicant has raised the Dilts patent, as explained above, is that Smotroff is simply a promotional business wire article directed to the MindDrive computer game which is defined by the Dilts patent. Thus, one skilled in the art would obtain an understanding of how the MindDrive computer game operates from the Dilts patent, not from a business wire article. In order to rebut the technical assertions of the Examiner which are not described in any technical detail in Smotroff, Applicant counters Smotroff using the Dilts patent. Applicant's reminder to the Examiner that the patent application as originally filed already dealt with the

---

MINDRIVE™ permits the user to operate a ski simulator, create art, a flight simulator, etc., on the computer using the GSR method. Conversely, TCS teaches the selection and utilization of one individual stimulus or more stimuli and considers the actual thoughts of the user. Present application, page 12, line 15 to page 13, line 10.

[19]Nor for any function selection means either.

MindDrive computer game and the Dilts patent in the Background section and that the technical discussion described therein would already distinguish the combination of Junker and Smotroff.

However, for completeness, Applicant addressed the deficiencies of the Smotroff, as well as U.S. Patent No. 5,016,213 (Dilts, et al., hereinafter "Dilts"), and in view of Junker, as follows.

Smotroff often uses the word "thought" and paints a picture to entice potential customers to perceive MindDrive as having the capability to detect particular thoughts for any type of control. But under further examination of Smotroff, MindDrive is a loop-structured system. In particular, Dilts, as cited on the MindDrive literature which is mentioned by Smotroff, discloses a device that continuously monitors electrodermal responses and continuously extracts the time rate of change of these responses using an analog network and amplifier without regard to, or knowing, the cursor's position. This skin-sensed time rate of change varies a resistance value for simulating a mouse in order to play a computer game. Dilts then transmits **the time rate of change information**, by simulating a computer mouse, to a computer. The game accordingly displays the effect of the user's electrodermal time rate of change in terms of moving an object on the computer screen. The MindDrive software within the PC-compatible computer is a "game-type" or a "mouse-type" software well-known in the art. This software is the recipient **only** of simulated mouse inputs which were derived from the time rate of change of electrodermal responses from the user. Viewing the object, the individual experiments with his/her eyesight, body movement and concentration to cause the object to move as desired. This interaction or feedback is commonly known as a loop-structured system.

Dilts has no capability nor suggestion to pre-store biological states or even pre-store electrodermal stimuli or even relate to specific electrodermal states in order to identify specific

thoughts.

> ...applicant's apparatus is designed to continuously adjust the signal representative of the electrodermal response...(Dilts, col. 6, lines 31-33).

Further, there is no mention by Dilts of a computer storing earlier electrodermal stimuli. Dilts presents the details of the GSR (galvanic skin response) amplifier 26 which performs the detection of time rate of change emanating from an iterative loop structure of electrodermal responses for a cursor to be readjusted. Dilts has no interest in psychological states. In particular,

> ...According to applicants' invention, the particular general or overall psychological state of the human individual using the apparatus is totally unimportant. (Dilts, col. 6, lines 59-64).

Dilts also has no means to store user stimuli nor a plurality of desired function control signals. This is to ensure his independence of any time delay; in fact, the time rate of readjustment action of the average time rate of change of electrodermal responses.

> ...the RC network 34 has a time constant slightly less than one-half second. Such time constant approaches the average reaction time...to visual stimuli... (Dilts, col. 11, lines 11-14).

Thus, because there is no storage of any plurality of previously-stored user stimuli and a plurality of desired function control signals, there is no function selection means taught or suggested by Smotroff nor by Dilts. Nor is there any identification means coupled to a function selection means that compares at least one stimulus to the correspondence to identify a function control signal corresponding to the at least one stimulus taught or suggested by Smotroff or Dilts. As mentioned previously, Dilts continually performs electrodermal response sensing and extracting of the time rate of change to control a resistance value which interfaces with a computer to move

a cursor. Dilts, and therefore Smotroff, does not store nor compare to a predetermined thought. Thus, there is no evidence to logically conclude that Smotroff or Dilts stores stimuli patterns for later control of functions based on the computer's previously stored stimulus. Dilts analog amplifier network operates constantly on a loop structured basis with electrodermal sensing feedback from the user attempting to readjust the cursor position as he/she desires. The only computer program used is the game software that processes the "mouse-type" game paddle variable resistance to fulfill the game requirements.

The Examiner's characterization of MindDrive operation is not even supported by Smotroff. In particular, the Examiner states:

> The "mind-control" software described in the Smotroff reference is a software program that enables a user to control a computer program using a figure-mounted sensor ***that monitors heart, temperature, blood-pressure volume, and electrical activity in the brain*** and transmits that information to an interface that plugs into a PC-compatible computer, which analyzes the data it receives and translates it into computer signals. The MindDrive software recognizes distinctive signals produced by different mental activity. (Emphasis added, Office Action, p. 3, lines 16-22).

Nowhere in Smotroff does it teach that the finger sensor monitors these parameters[20]. And further, as stated previously, Dilts even admits that it is not clear as to what are the causes of electrodermal resistance change:

> [Regarding] measuring and recording electrodermal response accompanying emotional and ... response accompanying psychologically induced stress ... although much is known about *electrodermal response*, much ***information is still lacking*** as to the variables affecting such response. (emphasis added, Dilts, col. 3, line 67 to col. 4, line 7)

and

> ...both plants and animals have been found to have *autonomic* systems controlling their electrodermal response for purposes which are ***not fully understood***. (emphasis added, Dilts, col. 1, lines 22-25).

[20]Dilts only mentions body temperature, respiration rate and heart beat in the Background of the Invention (Dilts, col. 1, lines 20-21) and also mentions that if a higher gain is used in the invention that the heart beat can also be detected (Dilts, col. 12, lines 64-66).

Thus, the Examiner's assertion that the MindDrive software "recognizes the distinctive signals produced by different mental activity and that the computer stores "stimuli patterns" (where is that even mentioned in Smotroff?) and that "the control functions are enacted based on the previously observed stimulus" are not taught anywhere in Smotroff. There is no teaching about comparing brain stimuli to stored stimuli anywhere in Smotroff nor in Dilts. Thus, Applicant submits that Smotroff or Dilts provides for no such teaching suggested by the Examiner and therefore does not make up for any deficiencies in Junker to obviate the invention of the present application.

The Examiner's response to all of the above was only directed to particular portions of the arguments (which the Examiner numerated) as follows:

> (Applicant Argument 3): *Smotroff often uses the word "thought" and paints a picture to entice potential customers to perceive MindDrive as having the capability to detect particular thoughts for any type of control. But under further examination of Smotroff, MindDrive is a loop-structured system.*

The Examiner responded:

> The Examiner is actually quite amused by this particular statement by the Applicant, as the Applicant's disclosure and numerous remarks since say exactly the same thing; particularly in regards to detecting particular thoughts for any type of control. (Final Office Action dated June 15, 2005, p. 14);
>
> (Applicant Argument 5): *Dilts also has no means to store user stimuli nor a plurality of desired function control signals. This is to ensure his independence of any time delay; in fact, the time rate of readjustment action of the average time rate of change of electrodermal responses.*

The Examiner responded:

> As the independent claims do not mention time delay or time rate of change, the rejections above are considered correct and proper. (Final Office Action, dated June 15, 2005, p. 15);
>
> (Applicant Argument 6): *Nowhere in Smotroff does it teach that the finger sensor monitors these parameters. And further, as stated previously, Dilts even admits that it is not clear as to what are the causes of electrodermal resistance change.*

The Examiner responded:

> Aside from what is taught by the Smotroff reference in particular, it is now quite well known today that finger sensors can and have measured heart rate, temperature and blood pressure at the very least. (Final Office Action, dated June 15, 2005, p. 15);
>
> (Applicant's Argument 7): *Thus, the Examiner's assertion that the MindDrive software "recognizes the distinctive signals produced by different mental activity and that the computer stores "stimuli patterns" (where is that even mentioned in Smotroff?) and that "the control functions are enacted based on the previously observed stimulus" are not taught anywhere in Smotroff.*

The Examiner responded:

> Once again, the Examiner turns to the Junker reference that plainly states that a memory store is used to store digital brain-body signals. (Final Office Action dated June 15, 2005, p. 15).

The intent of Applicant's arguments with regard to Dilts is to demonstrate that the MindDrive computer game, and by definition, Smotroff, does not teach or suggest the identification means asserted by the Examiner. The Examiner's parsing of Applicant's argument into Arguments 3, 5, 6 and 7 and then responding to each does not, in any way, rebut Applicant's argument that Dilts, and by definition Smotroff, does not teach any identification means, nor any function selection means either. Thus, for all of these reasons, Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55 and 67-70 remain patentable over the art of record and Applicant again respectfully requests that the §103(a) rejection be withdrawn.

II. THE EXAMINER ERRED IN CONCLUDING THAT CLAIM 2 IS UNPATENTABLE UNDER 35 U.S.C. §103(a) OVER JUNKER IN VIEW OF SMOTROFF AND FURTHER IN VIEW OF KUC

The Examiner finally rejected Claim 2 as being unpatentable under 35 U.S.C. §103(a) over Junker in view of Smotroff and further in view of Kuc. In particular, the Examiner states that:

> For claim 2, the combination of references includes the claimed subject matter as noted in the rejection of claim 1 above. However, neither reference is there biomagnetic stimuli input means.
>
> The biomedical magnetism imaging apparatus and method taught by Kuc et al performs biomagnetic imaging to determine the location and intensity of current sources within a subject by sensing the magnetic field within the subject. This is accomplished using a number of Superconducting Quantum Interference Devices (SQUIDs) that are fed magnetic field information using pickup coils (No. 4). One great advantage of this invention is the fact that fewer pickup coils and SQUID magnetometers are needed to gather needed information in a lesser amount of time than previous biomagnetometers. Also, input from multiple dipoles can be displayed simultaneously.
>
> As the system of Junker utilizes bio-imaging means to achieve its purposes, it presents the perfect platform onto which an imaging system such as Kuc may be applied. As EEG and EMG signals are already gathered, the MSI data could easily be examined for the same purposes. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate and MSI system similar to Kuc into the brain-body actuated system of Junker for the purpose of gathering vital information using fewer pickup coils in a lesser amount of time. (Final Office Action dated June 15, 2005, pp. 8-9).

However, since Claim 2 is dependent upon Claim 1, Claim 2 is patentable for the same reasons. In addition, as stated in previous responses by Applicant, Junker is directed to the recognition that an aggregate signal of EEG and EMG biopotentials which is necessary for proper feedback and which is limited to interpreting frequency spectra detected on the body. Junker, nor Junker in combination with Smotroff, do *not teach or even suggest implementing localization*, i.e., determining coordinates of stimuli generated by the thoughts of the user, as is accomplished by the stimuli input means of the present invention which can be achieved using magnetic source imaging, such as that suggested by Kuc. Thus, there is no incentive to even combine Junker and Smotroff with Kuc[21]. Furthermore, other than citing Junker with Smotroff,

[21]The mere fact that the references cited may be modified or even combinable does not allow the PTO to meet its burden absent a suggestion in the cited art of the desirability of the modification or combination. Moreover, the PTO may not "use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In re Fritch, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992).

the Examiner **adds nothing further** to his arguments to suggest combining Junker/Smotroff with Kuc that was discussed in the last Appeal Brief (dated February 2, 2001) and where the Board concluded that the Examiner had not established a prima facie case of obviousness on this rejection:

> ...We agree with appellant that the examiner has not established a convincing line of reasoning why it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the diagnostic imaging of Kuc (or imaging of Adachi) with the biofeedback control system of Junker. Nor has the examiner established how the teachings of Kuc (or Adachi) overcome the deficiencies in Junker. Therefore, we find that the examiner has not established a ***prima facie*** case of obviousness, and we will not sustain the rejection of claims 2, 44 and 45. (Decision on Appeal dated March 31, 1994, p. 6)

Therefore, for all of the above reasons, Applicant respectfully submits that Claim 2 is patentable over the art of record and respectfully requests that the §103(a) rejection be withdrawn.

III. THE EXAMINER ERRED IN CONCLUDING THAT CLAIM 18 IS UNPATENTABLE UNDER 35 U.S.C. §103(a) OVER JUNKER IN VIEW OF SMOTROFF AND FURTHER IN VIEW OF HARTZELL

The Examiner finally rejected Claim 18 as being unpatentable under 35 U.S.C. §103(a) over Junker in view of Smotroff and further in view of Hartzell. In particular, the Examiner states that:

> For claim 18, the combination of references above includes the claimed subject matter as discussed in the rejection of claim 1 above. However, one of the features that neither reference teaches is that the apparatus can be used by a plurality of users. Also a database for storing unique stimuli for respective users is also not included.
>
> The brainwave-responsive apparatus taught by **Hartzell** teaches an apparatus that is for use with one or more subject simultaneously for causing an output device to perform productive functions. The system consists of one or more EEG detectors (Nos. 10a-n) each having input lines (No. 12) from a plurality of user. The EEG detectors are designed to generate output signals corresponding to different brain waves to provide signals or actually controlling an output device (No. 30). The EEG devices also store unique stimuli depending on the user's brainwaves onto conventional strip chart recorders or magnetic tape. One advantage of this system is the fact that a productive function is performed using empathy training whereby two or more subjects may be trained to produce theta waves, either simultaneously or synchronously. Also elderly

> subjects can be trained to provide beta brainwaves on command.
>
> Since both Junker and Hartzell et al both pertain to brainwave controlled apparatus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the system of Junker to be used by a plurality of users and for storing user unique stimuli for the purpose of accomplishing and recording productive tasks through the use of simultaneous or synchronous activation through multiple users. Also, the benefits to the elderly and children should not be overlooked. (Final Office Action dated June 15, 2005, pp. 9-10).

However, since Claim 18 is dependent upon Claim 1, Claim 18 is patentable for the same reasons. In addition, the Examiner fails to address the further limitation of Claim 18 that states that the user unique stimuli are usable by the computer *for security or identification of users*. Nowhere does Hartzell, nor the combination of Junker/Smotroff and Hartzell, teach or suggest having a computer use these user unique stimuli for security or identification of users as specified in the '625 application on page 39, lines 5-17. Furthermore, other than citing Junker with Smotroff, the Examiner **adds nothing further** to his arguments to suggest combining Junker/Smotroff with Hartzell that was discussed in the last Appeal Brief (dated February 2, 2001) and where the Board concluded that the Examiner had not established a prima facie case of obviousness on this rejection:

> ...We agree with appellant that the examiner has not established where Hartzell remedies the deficiency in Junker noted above. (See brief at pages 25-26). We agree with appellant that the examiner has not established where Hartzell teaches or fairly suggests why it would have been obvious to one of ordinary skill in the art at the time of the invention to use the computer for security or identification purposes. Nor has the examiner established how the teachings of Hartzell overcome the deficiencies in Junker. Therefore, we find that the examiner has not established a ***prima facie*** case of obviousness, and we will not sustain the rejection of claim 18. (Decision of Appeal, dated March 31, 2004, p. 7)

Therefore, for all of the above reasons, Applicant respectfully submits that Claim 18 is patentable over the art of record and respectfully requests that the §103(a) rejection be

withdrawn.

IV. THE EXAMINER ERRED IN CONCLUDING THAT CLAIMS 44-45 ARE UNPATENTABLE UNDER 35 U.S.C. §103(a) OVER JUNKER IN VIEW OF SMOTROFF AND FURTHER IN VIEW OF ADACHI

The Examiner has rejected Claims 44-45 under 35 U.S.C. §103(a) as being unpatentable over Junker in view of Smotroff as applied to Claim 1 above and further in view Adachi.

> For claim 44, the combination of references above includes the claimed subject matter as noted in the rejection of claim 1 above. However, the reference does not cite localization means for identifying locations in the source of said stimulus.
>
> The device for measuring a retina reflected light amount and a gaze detecting apparatus using the same taught by Adachi includes a series of measuring devices (Nos. 11-14) are fixedly arranged at four corner positions of a monitor device. Each device includes a laser (No. 111), semitransparent mirror (No. 113), and charge couple device (CCD) (No. 114) that receives infrared rays emitted by the laser and reflected by the face of the person. An intersection point P among all four devices indicates the location and orientation of the pupil of the person. The retina characteristics are continually monitored to calculate the differing pupil position and displacement angles. The claimed localization means is met by the display device (No. 4) of Adachi that identifies on the display the location in the user of the source of the stimulus. One obvious application of this technology is the control of a cursor on a computer monitor in lieu of the up- and down- keys of a keyboard. This particular reference combines a high level of accuracy at a decreased cost from other retina position detectors.
>
> Since all three references pertain to biologically inputted devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a means for detecting movement of the user's eye to initiate a control signal for the purpose of using the eye as an easy and inexpensive way to manipulate the cursor controller around the monitor output.
>
> For claim 45, the aforementioned measurement devices also meet the adapting means for they adapt the display to change in response to a change in the location (eye movement) of the source.

However, Applicant submits that Claims 44-45 ultimately depend from Claim 1 and are patentable for the same reasons. Furthermore, other than citing Junker with Smotroff, the Examiner **adds nothing further** to his arguments to suggest combining Junker/Smotroff with Adachi that was discussed in the last Appeal Brief (dated February 2, 2001) and where the Board concluded that the Examiner had not established a prima facie case of obviousness on this

rejection:

> ...We agree with appellant that the examiner has not established a convincing line of reasoning why it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the diagnostic imaging of Kuc (or **imaging of Adachi**) with the biofeedback control system of Junker. Nor has the examiner established how the teachings of Kuc (or **Adachi)** overcome the deficiencies in Junker. Therefore, we find that the examiner has not established a ***prima facie*** case of obviousness, and we will not sustain the rejection of claims 2, 44 and 45. (Emphasis added, Decision on Appeal dated March 31, 1994, p. 6).

Therefore, for all of the above reasons, Applicant respectfully submits that Claims 44 and 45 are patentable over the art of record and respectfully requests that the §103(a) rejection be withdrawn.

CONCLUSION

In view of the above remarks, Applicant submits that the rejection of Claims 1-2, 4, 9, 12, 15, 17-18, 21, 38, 40, 44-45, 51, 55 and 67-70 is improper and should be reversed and such action is respectfully requested.

Respectfully submitted,

CAESAR, RIVISE, BERNSTEIN,
COHEN & POKOTILOW, LTD.

August 20, 2009

By Scott M. Slomowitz
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Please charge or credit our Account No. 03-0075 as necessary to effect entry and/or ensure consideration of this submission.

CERTIFICATE OF MAILING/TRANSMISSION PURSUANT TO 37 CFR 1.8

I hereby certify that this correspondence and any attachments referenced therein is/are being mailed/transmitted to the USPTO by: (A) first class U.S. mail with sufficient postage (37 CFR § 1.1(a)); (B) facsimile (37 CFR § 1.6 (d)); or (C) EFS-Web (37 CFR § 1.6(a)(4)) on the date shown below.

Date: August 20, 2009 Signature: Scott M. Slomowitz

Name: Scott M. Slomowitz

CLAIMS APPENDIX

8. CLAIMS APPENDIX

1. An apparatus for controlling a computer operation based on one or more stimuli sensed from at least one user thought, said apparatus comprising:

(a) stimuli input means coupled to the user for detecting at least one stimulus being caused by the at least one thought of the user;

(b) a computer having an operating system, coupled to said stimuli input means, for processing said at least one stimulus to produce a function control signal to control the operation of said computer wherein said computer does not require an articulated response from the user, said computer comprising:

(1) function selection means for receiving said at least one stimulus and wherein said function selection means comprises a memory including a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals;

(2) identification means, coupled to said function selection means, for comparing said at least one stimulus to said correspondence to identify a function control signal corresponding to said at least one stimulus, said function control signal being transmitted to the operating system of said computer.

2. The apparatus of Claim 1 wherein said stimuli input means comprises magnetic source imaging means.

4. The apparatus of Claim 1 further comprising auxiliary stimuli input means, coupled to said computer, for providing additional or alternative stimuli inputs from the user using equipments capable of measuring such emissions.

9. The apparatus of Claim 1 further comprising communicating means, coupled to said computer, for communicating information pertaining to the user's thoughts.

12. The apparatus of Claim 1 wherein said computer further comprises designating means coupled to said function selection means, said designating means permitting the user to designate a particular representation to be associated with said at least one stimulus.

15. The apparatus of Claim 1 wherein said stimuli input means comprises conditioning means for conditioning said at least one stimulus for use by said computer.

17. The apparatus of Claim 1 wherein said computer further comprises a database for storing inaccuracies regarding said correspondence between said plurality of previously-stored user stimuli and said plurality of desired function control signals.

18. The apparatus of Claim 1 wherein said computer further comprises respective data bases for storing user unique stimuli from respective users, said user unique stimuli being usable by said computer for security or identification of users.

21. The apparatus of Claim 1 wherein said computer further comprises stimuli selection means for selecting stimuli from the user based upon acceptance criteria to form said previously-stored user stimuli.

38. The apparatus of Claim 1 further comprising means for detecting coactive stimuli for increasing the dependability of said function selection means.

40. The apparatus of Claim 1 further comprising means for detecting sequential stimuli for increasing the dependability of said function selection means.

44. The apparatus of Claim 1 further comprising localization means for identifying locations in the user of the source of said at least one stimulus.

45. The apparatus of Claim 44 further comprising adapting means for adapting said apparatus to a change of location of the source of said at least one stimulus whenever the user moves.

51. The apparatus of Claim 1 further comprising bodily communication means, said bodily communication means being adapted to be coupled to the user, or within the user, to provide for a communication path for said at least one stimulus between the user's brain and a user body part to be controlled.

55. Apparatus for controlling computer operation from one or more stimuli sensed from one or more thoughts in a user's body, said apparatus comprising:

(a) detecting means for detecting said one or more stimuli sensed from said one or more thoughts to produce one or more detected stimuli,

(b) selecting means for receiving one or more of said detected stimuli to perform a function and selecting a correspondence to one or more user thoughts to produce a selected function and wherein said selecting means does not require an articulated response from the user,

(c) identification means for identifying one or more said detected stimuli as corresponding to said selected function for producing a function control signal,

(d) receiving means for receiving said function control signal for said controlling said computer operation.

67. An apparatus for controlling a computer operation based on one or more stimuli sensed from at least one user thought pattern, said apparatus comprising:

(a) stimuli input means coupled to the user for detecting at least one stimulus being caused by the at least one thought pattern of the user;

(b) a computer having an operating system, coupled to said stimuli input means, for processing said at least one stimulus to produce a function control signal to control the operation of said computer wherein said computer does not require an articulated response from the user, said computer comprising:

(1) function selection means for receiving said at least one stimulus and wherein said function selection means comprises a memory including a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals;

(2) identification means, coupled to said function selection means, for comparing said at least one stimulus to said correspondence to identify a function control signal corresponding to said at least one stimulus, said function control signal being transmitted to the operating system of said computer.

68. Apparatus for controlling computer operation from one or more stimuli sensed from one or more thought patterns in a user's body, said apparatus comprising:

(a) detecting means for detecting said one or more stimuli sensed from said one or more thought patterns to produce one or more detected stimuli,

(b) selecting means for receiving one or more of said detected stimuli to perform a function and selecting a correspondence to one or more user thought patterns to produce a selected function and wherein said selecting means does not require an articulated response from the user,

(c) identification means for identifying one or more said detected stimuli as corresponding to said selected function for producing a function control signal,

(d) receiving means for receiving said function control signal for said controlling said computer operation.

69. An apparatus for controlling a computer operation based on one or more stimuli sensed from at least one user thought category, said apparatus comprising:

(a) stimuli input means coupled to the user for detecting at least one stimulus being caused by the at least one thought category of the user;

(b) a computer having an operating system, coupled to said stimuli input means, for processing said at least one stimulus to produce a function control signal to control the operation of said computer wherein said computer does not require an articulated response from the user, said computer comprising:

(1) function selection means for receiving said at least one stimulus and wherein said function selection means comprises a memory including a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals;

(2) identification means, coupled to said function selection means, for comparing said at least one stimulus to said correspondence to identify a function control signal corresponding to said at least one stimulus, said function control signal being transmitted to the operating system of said computer.

70. Apparatus for controlling computer operation from one or more stimuli sensed from one or more thought categories in a user's body, said apparatus comprising:

(a) detecting means for detecting said one or more stimuli sensed from said one or more thought categories to produce one or more detected stimuli,

(b) selecting means for receiving one or more of said detected stimuli to perform a function and selecting a correspondence to one or more user thought categories to produce a selected function and wherein said selecting means does not require an articulated response from the user,

(c) identification means for identifying one or more said detected stimuli as corresponding to said selected function for producing a function control signal,

(d) receiving means for receiving said function control signal for said controlling said computer operation.

EVIDENCE APPENDIX

03079189 (THIS IS THE FULLTEXT)
Mind over movies
Booth, Stephen A
Popular Science (GPOS), v249 n6, p26, p.01
Dec 1996
TEXT:

ARMCHAIR FILM critics soon may be able to pLay actor and director in a new kind of movie. Miramax FiLms, a Disney vassal, says it wiLL begin "Net-casting" mini-movies via the World Wide Web, where viewers may control the action and the outcome by thought.

No joystick or mouse need appLy: This interactive cinema, sLated to debut next year, expLoits a recently reLeased input device called MindDrive ($140) to determine twists and turns of a multibranched pLot. MindDrive is a PC accessory that transLates mentaL activity into computer commands. In the seven-minute mini-films Miramax wiLL post on its Web site, a viewers mental reaction to run right or Left from danger, for instance, works like a cinematic polygraph to advance the story Line.

According to **MindDrive** 's maker, San Rafael, California-based The Other 90%, cerebral processes involving direction and emotional responses emit distinct bioeLectricaL signals. This output is measurabLe through the body's largest organ-the skin. **MindDrive** monitors these signals with a **sensor** strapped to a **fingertip** . The signaLs are then transmitted to a processor moduLe that translates these impulses into computer commands.

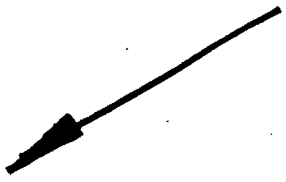
MindDrive requires special software; right now, onLy about 10 programs, listing for between $25 and $40, make use of the technology. These tend to be sports,simulations and exercises in mentaL gymnastics. UltimateLy, the company hopes to deveLop more serious and useful applications that can be used by handicapped people, for example.-Stephen A. Booth.

TEXT:
... danger, for instance, works like a cinematic polygraph to advance the story Line.

According to **MindDrive** 's maker, San Rafael, California-based The Other 90%, cerebral processes involving direction and emotional...

...distinct bioeLectricaL signals. This output is measurabLe through the body's largest organ-the skin. **MindDrive** monitors these signals with a **sensor** strapped to a **fingertip** . The signaLs are then transmitted to a processor moduLe that translates these impulses into computer...

10/7,K/12 (Item 1 from file: 635)
DIALOG(R)File 635:Business Dateline(R)



0609502 95-65789
The Other 90% Technologies Inc. breaks through the thought barrier with MindDrive
Smotroff, Mark
Business Wire (San Francisco, CA, US) s1 p1
PUBL DATE: 950616
WORD COUNT: 567
DATELINE: Sausalito, CA, US

TEXT:

June 16, 1995--In a development that leapfrogs current computer capabilities, The Other 90% Technologies, Inc. has unveiled MindDrive, the first-ever technology that enables people to operate computers and other products with their thoughts.

Now, in a new category of products slated for the mass market, consumers will be able to control devices, run computer programs and even play video games using just the power of their minds.

"Thought response technology will eventually enable people to use only their minds to accomplish what they want or need," said Ron Gordon, founder of The Other 90% Technologies, Inc. and inventor of the MindDrive. "With the MindDrive, you don't need a keyboard, a joystick or a mouse to work with a computer, all you need are your thoughts."

How the MindDrive Works

The **MindDrive** uses a sensor sleeve that simply fits onto your finger. A small control console receives signals from your thoughts, which are transmitted from your mind to the **finger sensor** . Then, the **MindDrive** interprets these various thought signals and directly moves the desired object or image on screen.

For years, it has been possible to measure the output and strength of these signals. The MindDrive, however, goes far beyond these basic measurements, by recognizing and reading the complex matrix of signals produced by our thoughts with a sophistication and precision that until now has been impossible.

Proprietary Artificial Intelligence software, developed by The Other 90% and built into the small MindDrive unit, interprets these signals and translates them into commands understood by the standard PC -- which directly moves the desired object or image on a video screen.

Consumer Uses for the MindDrive

The MindDrive is the first step toward establishing a wide range of thought-response consumer products for all ages. The MindDrive, along with a series of compelling, easy-to-use consumer-oriented applications, will be available in early 1996. It will have a retail price between $100 and $200, depending on how many software programs are included with the MindDrive. Software applications will be divided into three categories:

o An Entertainment Series -- thought controlled video games, toys and games.

o An Education Series -- training memory concentration and creativity skills.

o A Peak Performance Series -- programs to enhance work, school and sports performance.

Fourteen initial application programs are projected to be introduced with the MindDrive and will include: a downhill ski game where the player just thinks the turns and movement down the slope; an educational program that helps students learn new lessons and enhance their memory skills at the same time; and an art mind program which enables users to draw and color on the screen with their thoughts. The Other 90% is currently developing MindDrive applications with a world-wide team of 40 people, including a Ph.D. level programming group located in Siberia, Russia.

About The Other 90% Technologies, Inc.

The MindDrive was conceived by Ron Gordon in the mid-1970s, when he was heading Atari, Inc. Gordon is widely acknowledged for his ability to transform advanced, expensive technologies into inexpensive, easy-to-use consumer products, such as the pocket language translator and the first hand-held computer. Following several high-tech business successes, Gordon returned to his vision of a thought-controlled interface in 1988 and founded The Other 90%, based in Sausalito, Calif. The Other 90% Technologies, Inc., is a privately-held firm dedicated to delivering the ability to use just the mind to accomplish whatever people want or need.

TEXT:
...work with a computer, all you need are your thoughts."

How the MindDrive Works

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10/7,K/13 (Item 1 from file: 636)
DIALOG(R)File 636:Gale Group Newsletter DB(TM)

02786150 Supplier Number: 45653051 (THIS IS THE FULLTEXT)
SOMETHING TO THINK ABOUT: A NEW SENSOR THAT READS THE MIND
Sensor Business News, v2, n14, pN/A
July 5, 1995
TEXT:
Think for a minute about this: A sensor can read your mind. A company called (and this is true) The Other 90% Technologies Inc. unveiled MindDrive, a product which the company claims ranks as the first-ever technology that enables people to operate computers and other products with their thoughts.

The **MindDrive** uses a sensor sleeve that fits onto human fingers. A small control console receives signals from human thoughts, which are transmitted from the human mind to the **finger sensor** . Then the **MindDrive** interprets these various thought signals and directly moves the desired object or image on screen.

"With the MindDrive, you don't need a keyboard, a joystick or a mouse to work with a computer. All you need are your thoughts," said Ron Gordon, the company founder and CEO and MindDrive inventor.

Gordon is one of those guys with vision and passion for this new type of mind experimentation. "I couldn't get the possibility of controlling things directly--with my mind--out of my mind," he said.

Gordon told us his company, which makes the sensor components for the MindDrive, expects to haul in $60 million in revenues in 1996 and about $200 million in 1997. Those revenues will be derived from the applications and software to be embedded within the MindDrive product.

So what about the name of the company? Gordon was ready with a response. "Einstein said we only use 10 percent of our brains. This is learning to use the other 90 percent." (Ron Gordon, 415/332-0433; Mark Smotroff, 415/904 -7070.)

United States Patent [19]

Dilts et al.

[11] **Patent Number: 5,016,213**

[45] **Date of Patent: May 14, 1991**

[54] **METHOD AND APPARATUS FOR CONTROLLING AN ELECTRICAL DEVICE USING ELECTRODERMAL RESPONSE**

[76] Inventors: **Robert B. Dilts**, 3543 La Madrona Dr., Scotts Valley, Calif. 95066; **Trone L. Miller**, 1960 California St., #17, Mountain View, Calif. 94040

[21] Appl. No.: **642,318**

[22] Filed: **Aug. 20, 1984**

[51] **Int. Cl.**[5] **G06F 1/00**; G06F 15/28

[52] **U.S. Cl.** **364/900**; 364/410; 364/916.5

[58] **Field of Search** ..... 364/410, 413, 415, 417, 364/200 MS File, 900 MS File, 413.01–413.06, 413.27; 324/62 R, 63, 65 R; 128/630, 734, 902, 905; 273/1 GC, 85 G, 148 B

[56] **References Cited**

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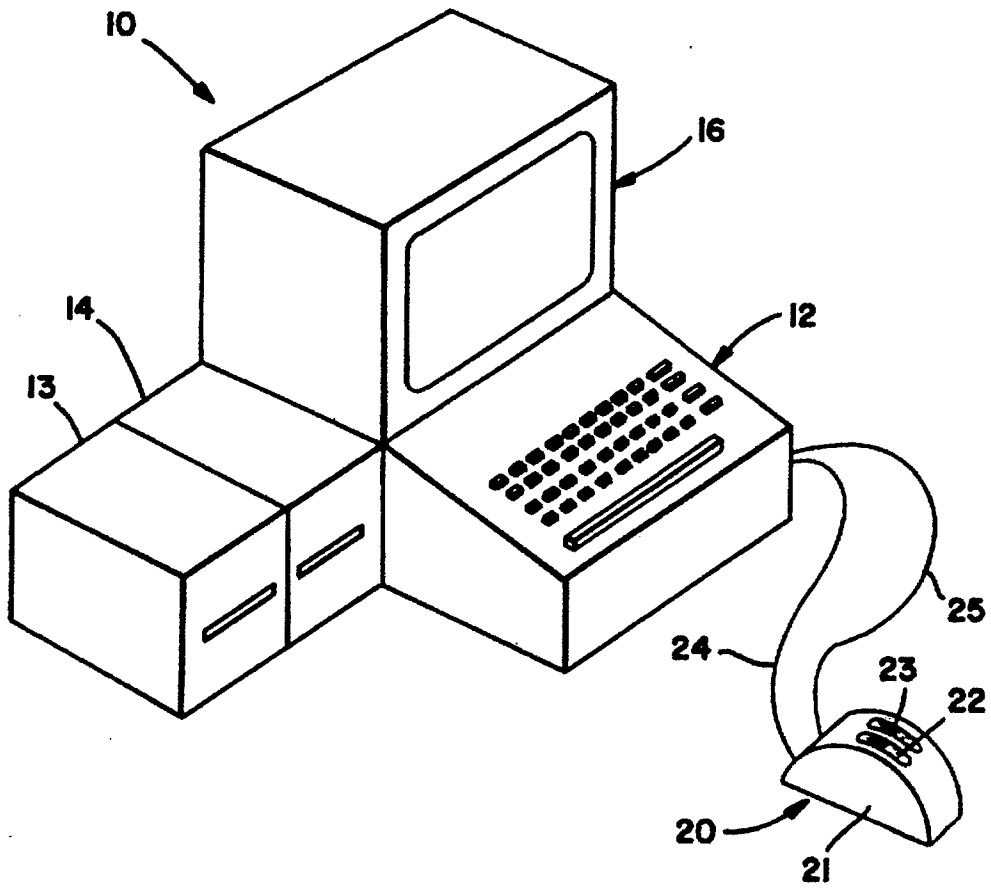
Primary Examiner—Gary V. Harkcom
Assistant Examiner—John A. Merecki
Attorney, Agent, or Firm—Thomas M. Freiburger

[57] **ABSTRACT**

A method and apparatus utilizing electrodermal response as a control mechanism. A specific embodiment of the method and apparatus utilizing a personal computer having a game paddle input port is described. The time rate of change in the electrodermal response of a biologic individual is sensed independently of the absolute value of the electrodermal response and continuously adjusted toward a time rate of change approaching the average time rate of change which the biologic individual cna consciously achieve in such electrodermal response. The resultant time rate of change is utilized as the input to a computer in order to provide the control.

6 Claims, 3 Drawing Sheets



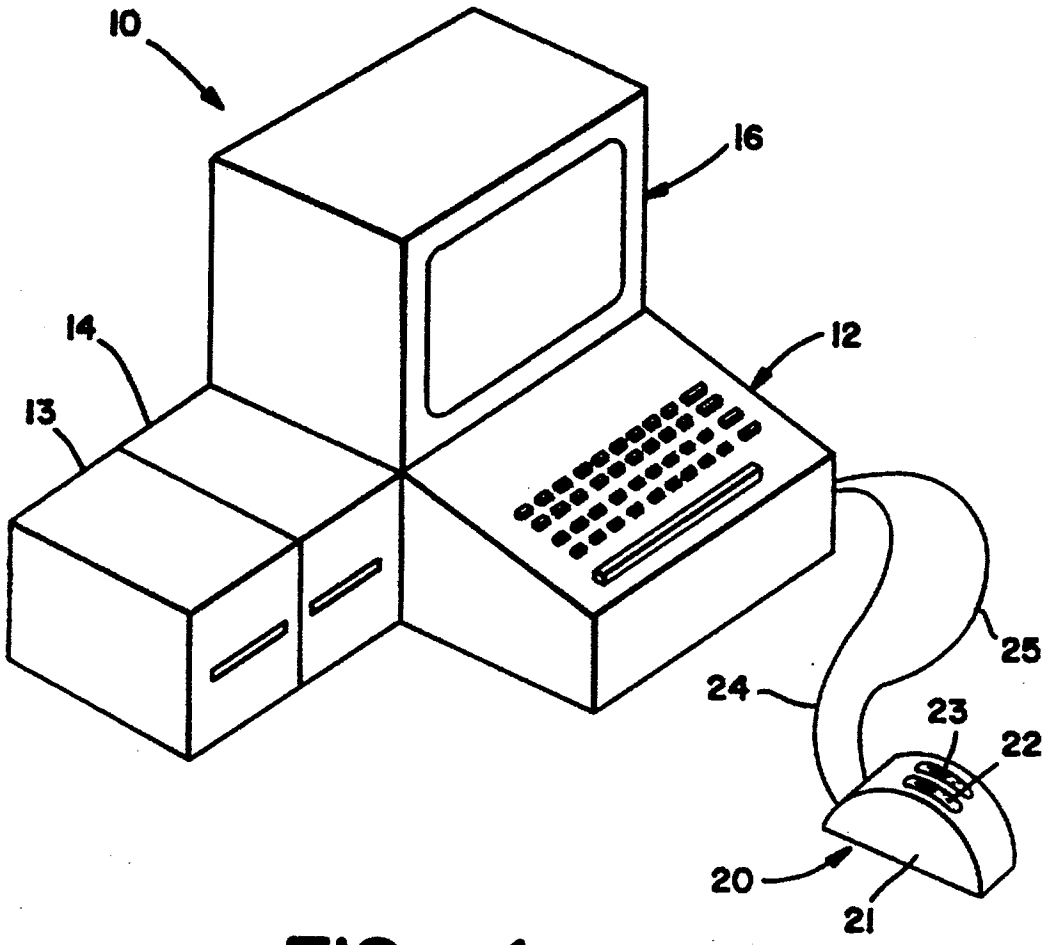

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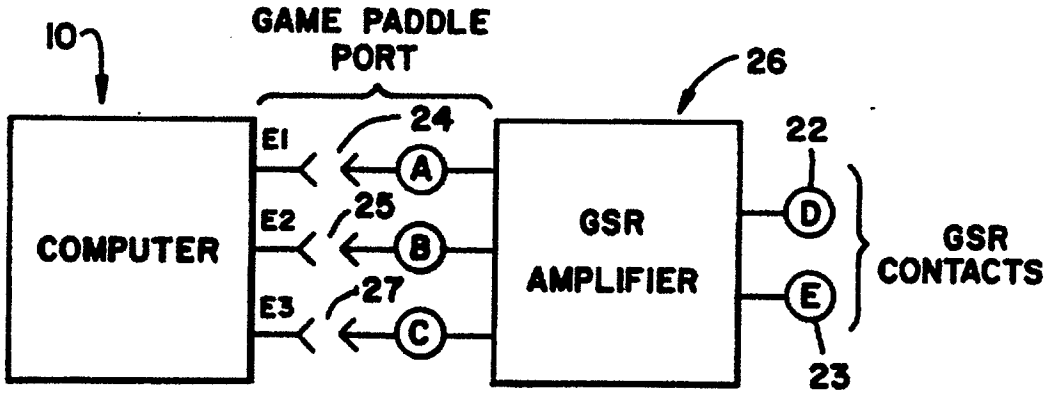
FIG _ 1


10
GAME PADDLE PORT
26
24
22
E1
A
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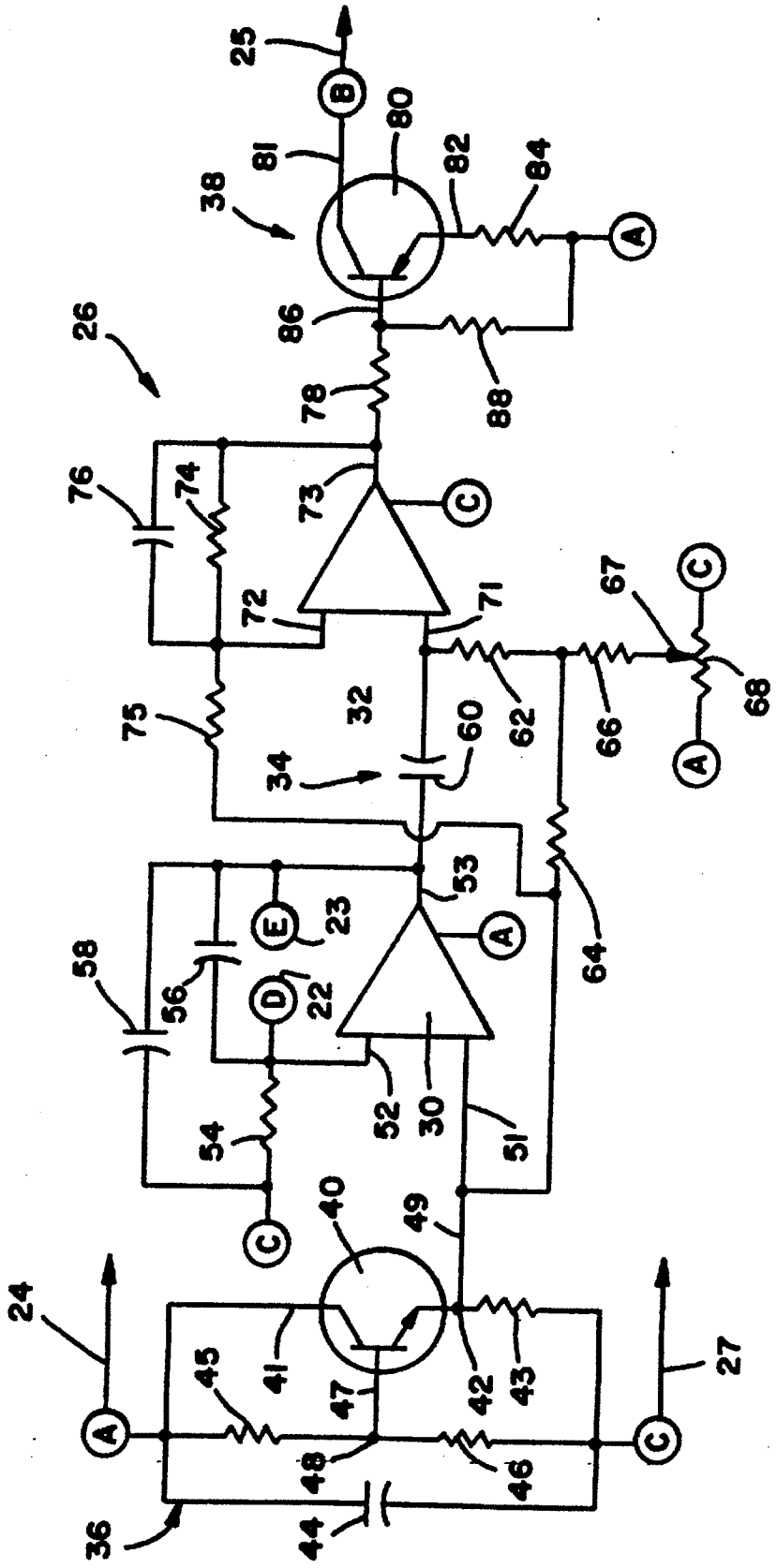
E2
B
COMPUTER
GSR AMPLIFIER
D
GSR CONTACTS
27
E3
C
E
23

FIG _ 2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E
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D
22
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A
C
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FIG - 3

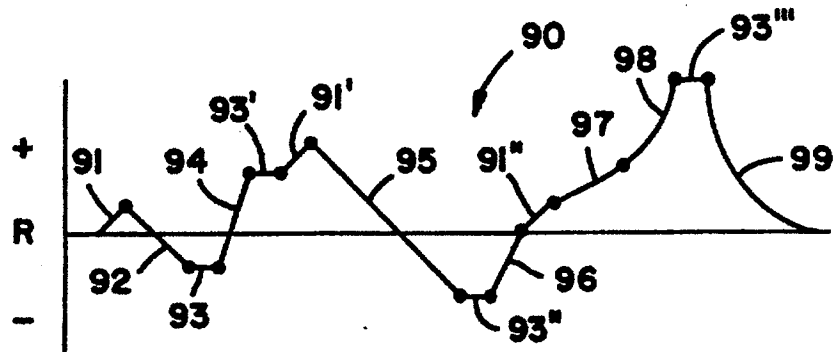

FIG_4

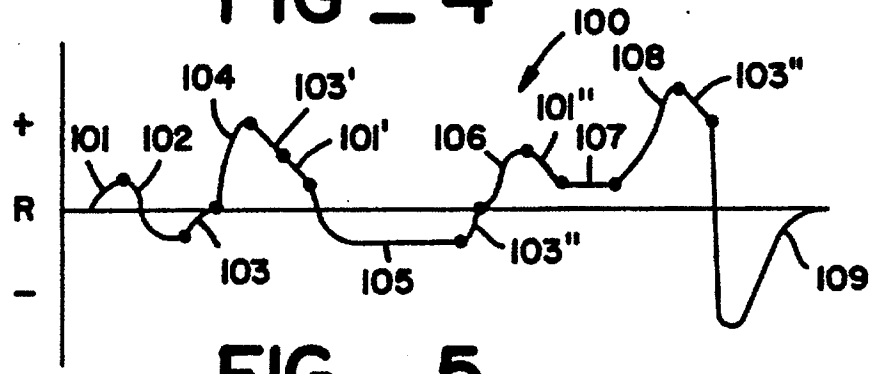

FIG_5

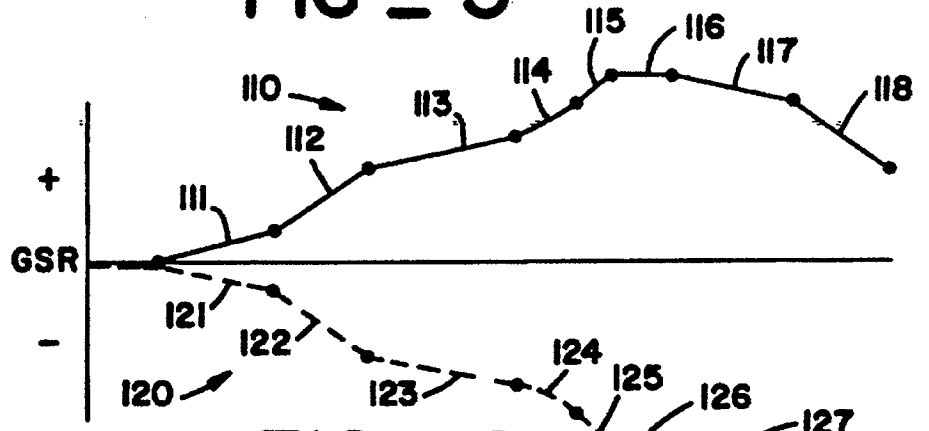

FIG_6

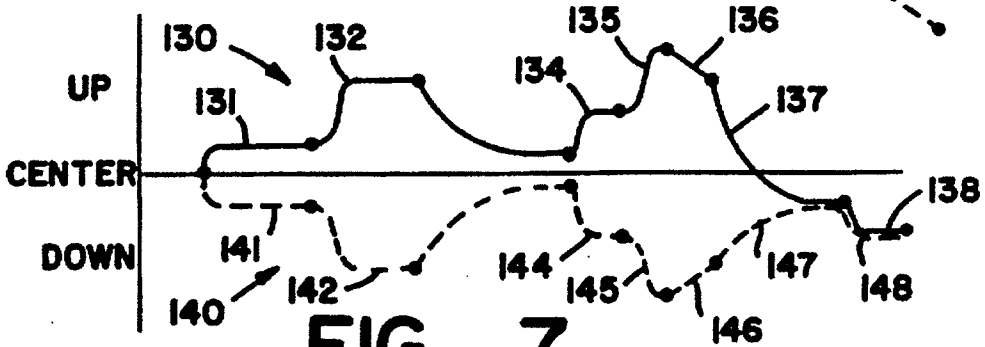

FIG_7

METHOD AND APPARATUS FOR CONTROLLING AN ELECTRICAL DEVICE USING ELECTRODERMAL RESPONSE

FIELD OF THE INVENTION

This invention relates to methods of and apparatus for sensing responses in autonomic systems of biologic individuals and more particularly to a method and apparatus utilizing electrodermal response in biologic individuals as a control means.

BACKGROUND OF THE INVENTION

All living individuals, i.e., plants and animals, are known to have complex systems for automatically maintaining their biological balances substantially independently of their central nervous system. Such systems are called "autonomic systems" and in warm blooded animals, for example, such systems are known to control such things as the body temperature, respiration rate and heart beat of the animal, for purposes which are fairly well understood. However, both plants and animals have been found to have autonomic systems controlling their electrodermal response for purposes which are not fully understood.

Furthermore, it has been found that the central nervous system of human beings can consciously and subconsciously control their autonomic systems including their electrodermal response. The conscious and subconscious control of respiration rate by the central nervous system is a common experience of all mankind. In recent years bio-feedback devices have enabled human experience of the conscious and subconscious control of such autonomic systems as heart beat, blood pressure, temperature, and electrodermal response, for example.

However, the conscious and subconscious control of such autonomic systems by the central nervous system as experienced in the prior art is often erratic, at best, particularly for electrodermal control. This is due, in part, to the fact that such autonomic systems are subject to simultaneous autonomic control which is by nature a primary effect, whereas the conscious and subconscious control of such autonomic systems by the central nervous system is a secondary effect. In other, words, although a human being may be able to consciously achieve an electrodermal response through the central nervous system, such response will tend to stimulate a counteracting autonomic response. Such autonomic response may be larger than the conscious response and may be followed by further autonomic responses directed toward restoring the original balance of the system. In addition, the individual may simultaneously exhibit an autonomic electrodermal response of many times such conscious response due to environmental effects such as the weather, temperature, atmospheric pressure, etc. Finally, a simultaneous subconscious electrodermal response through the central nervous system due to loud noises, personal psychological condition, etc., may occur which may either reinforce or counteract the conscious electrodermal response.

One object of this invention is to provide a reliable method and apparatus for utilizing "conscious" (i.e. "intentional" or "voluntary") electrodermal response and the like as a control means.

SUMMARY OF THE INVENTION

According to this invention, electrodermal response and the like of a biologic individual is utilized by programming an electrical device to respond in a desired humanly perceptible fashion to changes in the sense and amplitude of an electrical control signal only in a given range. A value characteristic of the state of an autonomic system, for example, the galvanic skin resistance of the individual, is then sensed and converted to an electrical signal, the absolute value of which changes in sense and amplitude with changes in the sensed value characteristic of the state of the autonomic system and such electrical signal is continuously adjusted in absolute value toward a given electrical value with a given time rate of change approaching the average time rate of change which can be achieved in the value characteristic of the state of the autonomic system by the central nervous system of a biologic individual. The resultant time rate of change in the absolute value of the electrical signal is converted to an electrical signal within the given range and used as the electrical control signal for the electrical device.

BRIEF DESCRIPTION OF THE DRAWING

This invention will be more fully understood from the following detailed description of the method when read in conjunction with the appended drawing showing a preferred embodiment of the apparatus wherein:

FIG. 1 is a perspective view of a stylized personal computer having a control means according to a preferred embodiment of this invention connected thereto.

FIG. 2 is a block diagram of the apparatus of FIG. 1.

FIG. 3 is a schematic diagram of a circuit for amplifying galvanic skin response and the like suitable for use in apparatus according to one embodiment of the teaching of this invention.

FIG. 4 is a graph of conventional resistance values at the GSR input of apparatus according to this invention plotted on the ordinate against time plotted on the abscissa.

FIG. 5 is a graph of the effective output resistance values of the apparatus corresponding to the input resistance values of FIG. 4 plotted on the ordinate against time on the abscissa.

FIG. 6 is a graph similar to FIG. 4 showing idealized GSR values for a first biologic individual in solid line and for a second biologic individual in broken line.

FIG. 7 is a graph similar to FIG. 5 but showing the position of an image on the face plate of a monitor in solid and broken lines corresponding to the resistance values of FIG. 6.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing an apparatus according to a preferred embodiment for practicing the method of this invention is shown. Thus, in FIG. 1, a conventional personal computer system 10 is shown as comprising a computer circuitry and keyboard unit 12 with a pair of disc or tape drives 13 and 14 and a cathode ray tube monitor 16 electrically connected thereto. Such system may be a personal computer system as manufactured and sold by the Apple, Atari, or Commodore computer manufacturing companies having a game paddle input port as is well known in the art. Such game paddles conventionally comprise simple variable resistors or potentiometers adapted to provide resistance values between about zero and about 150,000 ohms at the input port to the computer system. As is well known in the art, the circuitry 12 of the computer system may be

programmed to respond to manual adjustment of the resistance value of the game paddle to produce a desired display on the cathode ray tube monitor 16. This is conventionally done by prerecording the program on a disc or tape which is then inserted into one of the disc or tape drives 13 and 14 to program the circuitry 12 of the computer system. Such prerecorded programs may comprise a game of some sort, for example, having a controllable element such as an image of a ball or other character which can be caused to move about on the face plate of the cathode ray tube monitor by manually changing the setting of the variable resistor or potentiometer of the game addle. Although a wide variety of mechanical elements for effecting the change in the resistance value of game paddles known in the prior art have been used, all of such game paddle devices comprise essentially a resistance element having a first wire connecting one end thereof to one input terminal of the game paddle input port, and a second wire connecting a movable tap on resistor to another input terminal of the game paddle input port.

According to the embodiment of this invention shown in the drawing, the conventional game paddle is replaced by a pair of wires electrically connected to a circuit including a pair of electrode members preferably having a coating of noble metal thereon. One of such electrode members may be considered connected to one input terminal of the game paddle input port and the other of such electrode members may be considered connected to the other input terminal of the game paddle input port. By placing the contact members in galvanic contact with the skin of a human individual, the skin resistance of such human individual may be considered to be imposed upon the game paddle input port to the computer system 10.

For example, as shown in FIG. 1, a device 20 comprising a body 21 of insulating material and a pair of close spaced metallic electrode members 22 and 23 mounted thereon is substituted for the game paddle. If the electrode members 22 and 23 are, in fact, directly electrically connected to the game paddle input port of the computer system 10 by means of a pair of wires 24 and 25 each connected to a different one of the electrode members 22 and 23, it has been found that certain individuals can simply place a first of their fingers on one of the electrode members 22 and a second of their fingers on the other electrode member 23 and successfully substitute voluntary variations in their galvanic skin resistance for manual changes in a game paddle in controlling a preprogrammed computer system 10. However, such control is undependable at best and impossible for many individuals.

The fact that the resistance value present between the electrodes 22 and 23 will vary in time, when such electrodes are in continuous galvanic contact with the skin of a human individual is known in the art as the galvanic skin response (GSR) or Psycho galvanic reflex (PGR) or electrodermal reflex (EDR). All of these terms refer to the phenomena involving changing electrical properties of the skin of a biologic individual including at least two distinct classes one of which is resistance present between two spaced points on the skin surface and the other of which is a potential difference between two spaced points on the skin surface. For the purposes of this invention, such phenomena will be referred to collectively as "electrodermal response".

Apparatus for measuring and recording electrodermal response accompanying emotional and other stresses of a subject have come into widespread use, particularly in connection with such response accompanying psychologically induced stresses in what has come to be popularly known as a "lie detector". Although much is known about electrodermal response, much information is still lacking as to variables affecting such response. For discussion of some of the problems reference is made to Chapter One of the book entitled "TECHNIQUES IN PSYCHOPHYSIOLOGY" edited by Irene Martin and Peter H. Venables, published by John Wiley and Sons in 1980. (See also the article titled "Skin Resistance and Galvanic Skin Response" published by Robert Edelberg et al in the Archives of General Psychiatry, Volume 7, September 1962, at pages 163 through 169 and an article titled "Problems in Measurement of Electrodermal Phenomena—Choice of Method and Phenomena—Potential, Impedance, Resistance" by T. W. Forbes, published in Psychophysiology, Volume 1, No. 1, July 1964, at pages 26 to 30.

In the prior art, electrodermal response although quick and transient, was known as a sensitive indicator of sympathetic activity level occurring in response to such influences as frightening stimuli or other emotional stress. The electrodermal response was believed to be involuntary in the sense that subjects could not suppress it readily, if at all, although it was recognized that a subject could voluntarily produce an electrodermal response by deep breathing or moving. Applicants have found that through the use of the proper method and apparatus it is possible to learn to control the electrodermal response with improved reliability and further, that voluntary electrodermal response can be utilized reliably and effectively as a control resistance at the game paddle input port of a computer, for example.

Thus, referring to FIG. 1 of the drawing, in order for an individual to play a game, for example, programmed into the computer system 10 under the control of electrodermal response the individual must first achieve a galvanic skin resistance within the range of a conventional game paddle which may be 0 to 150,000 ohms, for example. Although galvanic skin resistances less than 150,000 ohms may be exhibited by any individual under appropriate circumstances and may be achieved by certain individuals voluntarily and at any time, normal galvanic skin resistance is somewhat higher and in many individuals may remain at or above 200,000 ohms. In addition, the relative ability to change galvanic skin resistance varies widely between individuals. Certain individuals may be able to achieve wide variations in their galvanic skin resistance while others will only be able to effect relatively small changes in their galvanic skin resistance. Furthermore, the galvanic skin resistance of an individual will tend to "drift" rather than remain at and about a given level over an extended period of time.

If a particular individual can achieve a galvanic skin resistance less than 150,000 ohms so that it is within the range of an ordinary game paddle, then the computer can be programmed so that relatively small changes in galvanic skin resistance will produce the full range of control normally requiring tens of thousands of ohms variation. However, this requires that the individual not only be capable of causing a very large initial change in galvanic skin resistance but that the individual be capable of making very small voluntary changes in galvanic skin resistance of the order of a few ohms after the necessary value below 150,000 ohms is reached. It has been found that certain individuals can achieve such

fine voluntary control. However, even those individuals are subject to involuntary drifting of their galvanic skin resistance by hundreds or thousands of ohms to values greater than 150,000 ohms due to external stimuli beyond their control.

According to this invention, the electrodes **22** and **23** are not directly connected to the input port of the computer **10**. Instead, the device **20** includes a circuit **26** interposed between the electrodes **22, 23** and the wires **24, 25**, respectively, as indicated by the block diagram in FIG. **2**. As shown in FIG. **2**, a third wire **27** is connected between the circuit **26** and the computer **10** in order to establish a common ground therebetween.

According to this invention, the circuit **26** senses the resistance present between electrodes **22, 23** and produces an electrical signal which changes in sense and amplitude directly with changes in the resistance sensed between the electrodes **22, 23**. The circuit **26** includes means which continuously adjusts the absolute value of such electric signal toward a given electrical value with a given time rate of change. Finally, the cirtuit **26** includes means for converting the resultant electrical value to corresponding resistance value within the range of a conventional game paddle which may be 0 to 150,000 ohms, for example.

Thus, if the electrodes **22, 23** are not in contact with the skin of a biologic individual, the resistance therebetween will be very high, approaching infinity. The resulting electrical signal produced by the circuit **26** would tend to be very high but for the fact that the circuit **26** automatically adjusts such signal toward a given value. Such given value is then converted to a resistance value which is within the range of a conventional game paddle and preferably toward the middle of such range although it could be toward the upper or lower end of the range as desired. If a very low resistance is connected between the electrodes **22, 23**, a correspondingly low electrical signal will be produced by the circuit **26** which will again be adjusted to the given value required to produce a resistance value within the range of a conventional game paddle. It will be understood that the resistance value produced in either case will be substantially the same value.

For ease of understanding, it may be assumed that the computer is programmed to produce a very simple game in which an image of a ball is presented on the faceplate of the cathode ray tube monitor **16** which image may be moved up and down on the faceplate of the monitor **16** by means of a conventional game paddle connected to the computer **10**. For example, adjustment of the game paddle to its 0 resistance setting may move the image of the ball to the extreme bottom of the monitor **16** while adjustment of the game paddle to its maximum resistance setting will move the image of the ball to the extreme top of the monitor **16** with intermediate adjustments of the game paddle producing intermediate positions of the image of the ball. If the game paddle is then replaced by the circuit **26** and electrodes **22, 23** according to this invention with a low resistance connected between the electrodes **22, 23**, the image of the ball will first move to the bottom of the faceplate of the monitor **16** and then upwardly until it reaches the preselected intermediate position. Similarly, if the low resistance is then removed from between the electrodes **22, 23**, the image of the ball will move to the top of the faceplate of the monitor **16** and then return to the preselected intermediate position where it will remain so long as the very high resistance therebetween is unchanged.

If two adjacent fingers of the hand of a human individual are placed in contact with the electrodes **22** and **23**, respectively, the image of the ball will first move to the bottom of the faceplate of the monitor **16** and then it will begin to move erratically between intermediate positions on the faceplate of the monitor **16**. It has been found that the human individual by observing the faceplate of the monitor **16** can learn to cause the ball to move predominantly in one direction or the other or to remain stationary in a given position through appropriate voluntary control of the electrodermal response by the central nervous system.

At this point it should be noted that applicants' apparatus is not a "lie detector" or a "bio feedback" device as proposed in the prior art based on electrodermal response. This fact is due to a fundamental difference between applicants' method and apparatus and the teaching of the prior art. Thus, according to applicants' method and apparatus, the position of the image of the ball on the faceplate of the monitor **16** does not have any relationship to a particular general or overall psychological state of the human individual using the apparatus whereas it would be necessary for each position of the image on the faceplate of the monitor **16** to correspond to a particular general or overall psychological state of the human individual using the apparatus in order for it to operate as a "lie detector" or "bio feedback" device in accordance with the teaching of the prior art. This is due to the fact that applicant's apparatus is designed to continuously adjust the signal representative of the electrodemal response of the human individual using the apparatus toward a given value in order to enable the individual to accomplish an intended purpose (i.e., position the image of the ball at a particular place or cause it to move in a particular direction on the faceplate of the monitor **16**.)

More particularly, "lie detector" devices and "bio feedback" devices of the prior art have included a manually adjustable control which was used to establish a given relationship between the operation of such devices and a particular psychological state of the subject. Changes in the psychological state of the subject from such given state are then monitored with information as to the given psychological state always being carefully maintained even though it was subsequently necessary to manually readjust the device in order to keep the electrodermal response within the range of the device. This is true even though certain of the prior art "lie detector" devices and "bio feedback" devices included means for automatically readjusting the device to keep the electrodermal response within the range of the device. By necessity, such readjustment had to be accomplished with a substantial time delay in order to avoid loss of information with respect to the given general or overall psychological state to which the response was to be related.

According to applicants' invention, the particular general or overall psychological state of the human individual using the apparatus is totally unimportant. Thus, no time delay is required in connection with the readjustment action according to applicant's invention. Instead, it is necessary that the time rate of the readjustment action approach the average time rate of change in electrodermal response that can be achieved by voluntary control through the central nervous system of the human individual using the apparatus. Thus, according

to applicants' invention, a particular position of the image on the faceplate of the monitor 16 may be achieved in a multiplicity of psychological states thereby insuring that the human individual using the apparatus has continuous control over the position of the image on the faceplate.

Referring to FIG. 3 of the drawing, a preferred embodiment of the circuit 26 for use in accordance with the teaching of applicants' invention is shown. The circuit 26 includes a first operational amplifier 30 connected across the electrodes 22 and 23 to provide a constant current flow therebetween regardless of the resistance value present therebetween. The varying voltage thus present at the output of the first operational amplifier 30 is connected to the input of the second operational amplifier 32 through an RC network 34. The second operational amplifier 32 amplifies the voltage present at the input thereof. The time constant of the RC network 34 is selected to provide a time rate of change which approaches the average time rate of change in electrodermal response which may be attained by the central nervous system under the conscious control of the subject.

The circuit 26 as shown in FIG. 3 is specifically adapted for connection to the game paddle input port of a computer as currently manufactured by the Apple Computer Company under the type designation "Apple II". In such a computer a five volt power supply with respect to the computer ground is available for connection to one end of the variable resistor of the game paddle through the wire 24 with the other end of the variable resistor connected to the computer ground through the wire 27 and the adjustable tap of the variable resistor connected to the input port through the wire 25.

In the circuit 26 according to the embodiment of the invention shown in FIG. 3, all of the points labeled A are connected to the five volt power supply through the wire 24, all of the points labeled C are connected to the computer ground through the wire 27 and the point labeled B is connected to the game paddle input port through the wire 25. As shown at the left side of FIG. 3, a first transistor circuit 36 is connected between the five volt power supply and computer ground through the wires 24 and 27, respectively. As shown at the right of FIG. 3, a second transistor circuit 38 is connected between the five volt power supply and the game paddle input port through the wires 24 and 25, respectively.

Thus the first transistor circuit comprises a transistor 40 having its collector 41 connected to the five volt power supply and its emitter 42 connected through a resistor 43 to computer ground. A capacitor 44 is connected in parallel with a pair of series connected resistors 45 and 46 between the collector 41 and emitter 42 of the transistor 40. The base 47 of the transistor 40 is connected to the junction 48 between the resistors 45 and 46. The first transistor circuit 36 functions to provide a constant reference voltage of about two and one-half volts at the output 49 thereof and to smooth out any voltage fluctuations which may be present in the voltage supplied by the computer 10. The reference voltage output 49 of the transistor circuit 36 is taken between the emitter 42 of the transistor 40 and the resistor 43 and is connected directly to one input 51 of the operational amplifier 30.

One of the electrodes 22 is directly connected to the other input 52 of the operational amplifier 30. The other electrode 23 is directly connected to the output 53 of the operational amplifier 30. A resistor 54 of large resistance value is connected between the electrode 22 and computer ground thus limiting the current flow between the electrodes 22 and 23 to a very low value in order to reduce toward minimum any possibility that such current flow might stimulate or otherwise affect the autonomic system or central nervous system of the subject whose electrodermal response is to be utilized.

Thus the operational amplifier 30 will cause a given small current flow through the galvanic skin resistance of a subject in contact with the electrodes 22 and 23 regardless of the value of such skin resistance. The voltage at the output 53 of the operational amplifier 30 will fluctuate as required to maintain the given small current flow between the electrodes 22 and 23 regardless of variations in the galvanic skin resistance present between the electrodes 22 and 23.

A capacitor 56 is connected across the electrodes 22 and 23 and a capacitor 58 is connected between the output 53 of the operational amplifier 30 and computer ground. The capacitors 56 and 58 function to filter out noise and spurious responses which may be present between the output of operational amplifier 30 and computer ground 27.

The voltage present at the output 53 of the operational amplifier 30 is coupled to the operational amplifier 32 through the RC network 34. The RC network 34 comprises a capacitor 60 having one terminal connected to the output 53 of the operational amplifier 30. The other terminal of the capacitor 60 is connected to the input 51 of the operational amplifier 30 through the series connected resistors 62 and 64. The junction between the series connected resistors 62 and 64 is connected through a resistor 66 to the adjustable center tap 67 of a potentiometer 68. The potentiometer 68 has its opposite ends connected to the five volt power supply and computer ground through the wires 24 and 27, respectively.

The other terminal of the capacitor 60 is also directly connected to one input 71 of the operational amplifier 32. The other input 72 of operational amplifier 32 is connected to the output 73 thereof through a resistor 74 and to the reference voltage at 49 through a resistor 75. A capacitor 76 is connected in parallel with the resistor 74. The output 73 of the operational amplifier 32 is connected through a resistor 78 to the second transistor circuit 38.

The second transistor circuit 38 comprises a transistor 80 having its collector 81 connected to the game paddle input port through wire 25. The emitter 82 of the transistor 80 is connected to the five volt power supply through a resistor 84. The base 86 of the transistor is connected both to the five volt power supply through a resistor 88 and to the output 73 of the second operational amplifier 32 through the resistor 78. The function of the second transistor circuit 38 is to present a variable resistance value at the game paddle input port of the computer 10 which simulates the variable resistor of a conventional game paddle. Thus the voltage applied to the base 86 of the transistor 80 of the transistor circuit 38 will determine the value of the effective resistance presented by the transistor circuit 38 to the game paddle input port of the computer 10.

The RC network 34 in combination with the operational amplifier 32 functions as a slope detector with respect to changes in the resistance present between the electrodes 22 and 23. In other words, the RC network 34 and operational amplifier 32 with its associated cir-

cuitry apply a voltage to the base 86 of transistor 80 which is representative of the time rate of change in the resistance value present between the electrodes 22 and 23 as will be more fully described hereinafter. It will be understood that if the resistance value between the electrodes 22 and 23 is constant, no signal will be coupled through the capacitor 60 to the input 71 of the operational amplifier 32. In such condition, the center tap 67 of the variable resistor 68 is adjusted to provide a voltage which when amplified by the operational amplifier 32 and applied to the base 86 of the transistor 80 through the resistor 78 will cause the transistor circuit 80 to produce an effective resistance value within the range of a conventional game paddle. For example, the transistor 80 and resistors 84, 88 may be selected so that an appropriate adjustment of the center tap 67 will produce a given resistance value between the five volt power supply at wire 24 and the game paddle input port at wire 25 which is located at or about the middle of the range of a conventional game paddle. Changes in the electrical resistance value present between the electrodes 22 and 23 will then produce changes in the effective resistance value present between the five volt power supply and the game paddle input port as more fully described with reference to FIGS. 4 through 7.

In an embodiment of this invention as actually constructed and successfully operated, the electrical and electronic components of the circuit 26 as shown in FIG. 3 of the drawing were as follows:

Operational amplifier 30	National LM 358
Operational amplifier 32	Dual Op-amp.
Transistor 40	Motorola 2N4400
Resistor 43	I.R.C. 1.5K ohm
Capacitor 44	Mallory 4.7 MFD
Resistor 45	I.R.C. 10K ohm
Resistor 46	I.R.C. 19K ohm
Resistor 54	I.R.C. 3.3 MEG.
Capacitor 56	Mallory 4.7 MFD
Capacitor 58	Mallory .1 MFD
Capacitor 60	Sprague 100 MFD
Resistor 62	I.R.C. 4.7K ohm
Resistor 64	I.R.C. 220 ohm
Resistor 66	I.R.C. 220K ohm
Potentiometer 68	I.R.C. 100K ohm
Resistor 74	I,R.C. 1 MEG ohm
Resistor 75	I.R.C. 560 ohm
Capacitor 76	Mallory .1 MFD
Resistor 78	I.R.C. 100K ohm
Transistor 80	Motorola 2N 4402
Resistor 84	I.R.C. 1.5K ohm
Resistor 88	I.R.C. 51K ohm

Referring to FIGS. 4 and 5 of the drawing, a pair of corresponding conceptual graphs of resistance values plotted on the ordinate with respect to time plotted on the abscissa are shown. Thus the graph of FIG. 4 represents a resistance value changing in time between the electrodes 22 and 23. The graph of FIG. 5 represents the resulting changing effective resistance of the transistor circuit 38 at corresponding points in time according to this invention.

It is emphasized that according to the teaching of this invention, the base line resistance value shown in FIG. 4 has no significance whatever other than to aid in the understanding of the following description and may be hundreds of thousands of ohms. No matter what the absolute value of such base line is, so long as it remains constant, the resulting resistance value of the transistor circuit 38 will be a value at or about the middle of the resistance range of a conventional game paddle as represented by the base line in FIG. 5.

If the resistance present between the electrodes 22 and 23 increases as represented by the graph segment 91 of FIG. 4, a resulting increase in the given resistance value of the transistor circuit 38 will occur as represented by the graph segment 101 in FIG. 5. According to this invention, the slope of the segment 91 of FIG. 4 will determine the height reached by the segment 101 above the base line of FIG. 5. If the resistance present between the electrodes 22 and 23 then decreases as represented by the graph segment 92 of FIG. 4, the resistance value of the transistor circuit 38 will decrease as shown by the graph segment 102 in FIG. 5. As shown by the graph segment 102, the decrease in resistance value of the transistor circuit 38 will initially have a slope greater than the slope of the segment 92 and again, the amount by which the effective resistance of the transistor circuit 38 decreases below the base line of FIG. 5 will be directly proportional to the slope of the graph segment 92 of FIG. 4. If the resistance value between the electrodes 22 and 23 then remains constant for a period of time as represented by the graph segment 93 of FIG. 4, the effective resistance value of the transistor circuit 38 will return to the given resistance value of the base line of FIG. 5 as indicated by the graph segment 103.

If the resistance value present between the electrodes 22 and 23 then increases at a high slope as represented by the graph segment 94 in FIG. 4, the effective resistance value of the transistor circuit will increase rapidly to a higher value representative of the higher slope of the graph segment 94 as indicated by the graph segment 104 of FIG. 5. Again, if the resistance value present between the electrodes 22 and 23 remains constant as indicated by the graph segment 93' of FIG. 4, the effective value of the transistor circuit 38 will decrease toward the given base line value as shown by the graph segment 103' of FIG. 5.

If the resistance value between the electrodes 22 and 23 again increases as shown by the graph segment 91' with a slope identical to the graph segment 91, the resultant effective resistance of the transistor circuit 38 represented by the graph segment 101' in FIG. 5, will approach a value identical to that represented by the graph segment 101 of FIG. 5.

More importantly, if the resistance value present between the electrodes 22 and 23 changes with a given slope over an extended period of time as represented by the graph segment 95 in FIG. 4, the effective resistance value of the transistor circuit 38 will attain a given constant value as represented by the graph segment 105 in FIG. 5. As represented by the graph segment 93" of FIG. 4, if the resistance value present between the electrodes 22 and 23 attains a given value and then remains constant, the effective resistance value of the transistor circuit 38 will tend to return to its given base value as represented by the graph segment 103" of FIG. 5.

Graph segments 96, 91" and 97 of FIG. 4 considered in conjunction with graph segments 106, 101" and 107 of FIG. 5 illustrate that if the resistance value present between the electrodes 22 and 23 increases with a given slope and then such slope decreases, the effective resistance value of the transistor circuit 38 will first increase to a high value corresponding to the initial slope and then decrease to a lower values corresponding to the decreasing slopes.

Graph segments 98 and 99 of FIG. 4 in conjunction with graph segments 108 and 109 of FIG. 5 illustrate that an exponential increase or decrease in the resistance present between the electrodes 22 and 23 will result in a modified exponential increase or decrease in the resistance value of the transistor circuit 38.

It is pointed out that the graph shown in FIG. 5 is an idealized approximation intended to illustrate the effects of the time constant of the RC network 34. In the circuit 26 according to the embodiment of this invention shown in FIG. 3, the RC network 34 has a time constant slightly less than one-half second. Such time constant approaches the average reaction time of the human central nervous system to visual stimuli where discrimination between more than two qualities is required. Thus, referring to graph segment 93''' in FIG. 4 and corresponding graph segment 103''' in FIG. 5, the time rate of change at which a given absolute value present between the electrodes 22 and 23 is accommodated to tend to provide an effective resistance value for the transistor circuit 38 corresponding to the base line value shown in FIG. 5 approaches the average time rate of change which can be made in the resistance value present between the electrodes 22, 23 by the central nervous system of an individual.

Referring to FIG. 6, a graph representing the galvanic skin resistance of a first individual imposed upon the electrodes 22 and 23 plotted on the ordinate against time on the abscissa is represented by the solid line 110. Similarly, a graph of the galvanic skin resistance of a second individual plotted on the ordinate against time on the abscissa is represented by the broken line 120.

Referring to FIG. 7, the position of an image on the face plate of the cathode ray tube monitor 16 of the computer 10 according to this invention is plotted on the ordinate against time on the abscissa. The solid line 130 represents the position of the image in response to the galvanic skin resistance of the first individual shown by the solid line 110 in FIG. 6 and the broken line 140 in FIG. 7 represents the position of the image in response to the galvanic skin resistance of the second individual represented by the broken line 120 in FIG. 6. Thus referring to the extreme left hand side of FIGS. 6 and 7, it will be understood that according to the teaching of this invention as described hereinabove, if the galvanic skin resistance of the two individuals remains constant for a period of time, the image on the face plate will be substantially centered regardless of the relative absolute values of their galvanic skin resistance. When the galvanic skin resistance of the first individual increases with a given slope as indicated by the graph segment 111 in FIG. 6, the image on the face plate will move upwardly to a given position where it will remain as indicated by the graph segment 131 in FIG. 7 so long as the given slope is maintained. If the slope is increased as indicated by the graph segment 112, the image on the face plate will move upwardly to a new position as indicated by the graph segment 132 in FIG. 7 where it will remain until the slope again changes as indicated by the graph segment 113 in FIG. 6 at which time it will move to a new position as indicated by the graph segment 133 in FIG. 7.

Graph segments 114 and 115 in FIG. 6 illustrate further increases in the galvanic skin resistance of the first subject at different slopes until a fairly high galvanic skin resistance is attained as indicated by the graph segment 116. Similarly, graph segments 134 and 135 illustrate the position of the image on the face plate corresponding to the slopes of the segments 114 and 115. The graph segment 136 in FIG. 7 in conjunction with the graph segment 116 of FIG. 6 illustrates that the image will tend to return to center when the galvanic skin resistance of the first individual remains constant even though it is now at a much higher absolute value.

Graph segments 121 through 126 of the graph 120 in FIG. 6 are mirror images of graph segments 111 through 116 of graph 110. Similarly, graph segments 141 through 146 of FIG. 7 are mirror images of graph segments 131 through 136.

It will be seen that although there is a wide difference between the absolute values of the galvanic skin resistance of the first individual as represented by graph segment 116 and the galvanic skin resistance of the second individual as represented by the graph segment 126, the image on the face plate of the cathode ray tube monitor will nevertheless tend to return to about the middle of the face plate. Furthermore, it will be seen that the first and second individuals can achieve identical control of the image in spite of the wide disparity between their galvanic skin resistances. In other words, it will be seen that, since graph segments 117 and 118 have the same slope as graph segments 127 and 128 in FIG. 6, the resultant position of the image on the face plate will be identical as indicated by graph segments 137 and 147, 138 and 148 of FIG. 7. Thus, if the first and second individuals have the same intention, they can achieve the same position of the image on the face plate regardless of the state of their respective galvanic skin resistances.

Alternatively, graphs 110 and 120 may represent the galvanic skin resistance of the same individual at two different times. First when the individual's autonomic system is causing his galvanic skin resistance to increase over a period of time as represented by graph 110. Graph 120 would indicate that at a different time, the individual's autonomic system was causing a decrease in the galvanic skin resistance of the individual.

According to this invention, it has been found that individuals can modify the slope of an increase or decrease in galvanic skin resistance at will, thereby enabling the individual to control the position of an image on the face plate of the cathode ray tube monitor reliably and with repeatable certainty. The same signal which controls the position of the image on the face plate of the cathode ray tube monitor 16 can be used to control the position of other instrumentalities such as robots or robotic devices, for example.

It is pointed out that the changes in the effective resistance of the transistor circuit 38 according to this invention need not extend throughout the full range of a conventional game paddle. Instead, appropriate programming of the computer 10 can be used to amplify much smaller changes in the resistance value to enable the full range of control of the position of the image on the face plate of the cathode ray tube monitor. In this regard, it is noted that the resistor 74 may be selected to provide a desired gain in the operational amplifier 32 and thus the range of variation in the effective resistance of the transistor circuit 38. In the embodiment of this invention shown in the drawing, a gain of about 2000 has been found to be preferable. A higher gain will make the circuit so sensitive that even the heartbeat of the individual can be detected. Lower gains tend to require excessive concentration on the part of the individual in order to effect a time rate of change in gal-

vanic skin resistance sufficient to produce the desired positioning of the image on the face plate.

It is believed that those skilled in the art will make obvious modifications in the specific circuit 26 as shown in the drawing and specifically described hereinabove without departing from the scope of applicants' method and apparatus as taught above and claimed in the following claims.

What is claimed is:

1. The method of utilizing electrodermal response or other autonomic nervous system functions of a biological individual as a conscious and intentional control means, comprising the steps of:

a) programming an electrical device to respond in a desired humanly perceptible fashion to changes in the sense and amplitude of an electrical control signal only in a given range within which the electrical device is capable of response;

b) sensing a value characteristic of the state of said electrodermal response or other autonomic nervous system function of the individual;

c) converting said sensed value into an electrical signal which changes in sense and amplitude with changes in said sensed value;

d) continuously adjusting said electrical signal toward a given electrical value which represents a zero rate of change of the sensed value, with a range of velocities of adjustment approaching the average range of velocities of adjustment which can be achieved by the central nervous system of said biologic individual in said value characteristic of the state of said electrodermal response or other autonomic nervous system function;

e) deriving a representation of said adjustment of the electrical signal and converting it to an electrical output signal having a value corresponding to a zero rate of change of the sensed value at about the middle of said given range and which varies directly in sense and amplitude with changes in said representation, with a difference between the minimum and maximum values thereof that is a substantial portion of said given range;

f) utilizing said electrical output signal as said electrical control signal by inputting the electrical output signal to said electrical device, and

g) through the biologic individual, consciously making inputs to the central nervous system in order to affect the autonomic nervous system to induce changes to said value characteristic in a positive or negative direction and thereby inducing a response in the electrical device in a positive or negative direction.

2. Apparatus utilizing electrodermal response or other autonomic nervous system functions of a biologic individual as a conscious control means, comprising in combination:

a) an electrical device programmed to respond in a desired humanly perceptible fashion to changes in the sense and amplitude of an electrical control signal only in a given range at the input thereto, said given range being a range within which the electrical device is capable of response;

b) means for sensing a value characteristic of the state of said electrodermal response or other autonomic nervous system function;

c) means for converting said sensed value into an electrical signal which changes in sense and amplitude with changes in said sensed value;

d) means for continuously adjusting said electrical signal toward a given electrical value which represents a zero rate of change of the sensed value, with a range of velocities of adjustment approaching the average range of velocities of adjustment which can be achieved by the central nervous system of said biologic individual in said value characteristic of the state of said electrodermal response or other autonomic nervous system function;

e) means for deriving a representation of said adjustment of the electrical signal and converting it to an electrical output signal having a value corresponding to a zero rate of change of the sensed value at about the middle of said given range and which varies directly in sense and amplitude with changes in said representation, with a difference between the minimum and maximum values thereof that is a substantial portion of said given range; and

f) means coupling said electrical output signal to said input of said electrical device to provide said electrical control signal thereto;

g) whereby the biologic individual consciously makes inputs to the central nervous system in order to affect the autonomic nervous system to induce changes to said value characteristic in a positive or negative direction and thereby inducing a response in the electrical device in a positive or negative direction.

3. The apparatus of claim 2, wherein the means for continuously adjusting the electrical signal includes an RC (resistance-capacitance) network receiving said electrical signal.

4. The apparatus of claim 3, wherein the RC network has a time constant of about one-half second.

5. The apparatus of claim 2, wherein the electrical device comprises a computer pre-programmed to perform selected operations in response to signals in a given range applied to an input means of the computer, and wherein

the apparatus includes a sensor means for sensing a time varying absolute value representative of the state of the autonomic nervous system of the individual,

the means for sensing a value characteristic and the means for converting the sensed value include first circuit means having an input and an output with the input thereof connected to the sensor means, said first circuit means having means for producing a time varying electrical signal corresponding to said sensed time varying absolute value of the autonomic nervous system,

the means for continuously adjusting said electrical signal includes second circuit means having an input and an output, with the input thereof connected to the output of the first circuit means, said means for continuously adjusting further including means for producing a composite time varying electrical signal at the output of the second circuit means, representing the continuous adjustment of the electrical signal,

the means for deriving a representation of said adjustment including third circuit means having an input and an output, with the input thereof connected to the output of the second circuit means, said third circuit having means for converting the composite time varying electrical signal at the output of the second circuit means to said signals in said given range, and

the means coupling said electrical output signal includes means connecting the output of the third circuit means to said input means of said computer.

6. The apparatus of claim 2, wherein

said electrical device has an input,

the means for sensing a value characteristic includes a pair of electrodes with means for connection to the individual at spaced locations, and with means for establishing a constant electrical current flow between the electrodes,

the means for converting said sensed value includes an operational amplifier having two inputs and an output,

the means for continuously adjusting said electrical signal includes means connecting one of said electrodes to one input of the operational amplifier through the capacitor of a resistance-capacitance network having an RC (resistance-capacitance) time constant of about one-half second,

the means for deriving a representation of said adjustment includes resistor means connecting the output of the operational amplifier to the other input thereof to establish a given gain through the operational amplifier, and

the means coupling said electrical output signal to said input of said electrical device includes means for converting the output of the operational amplifier to an electrical control signal in said given range and for applying said control signal to the input of said electrical device.

* * * * *

RELATED PROCEEDINGS APPENDIX

Paper No. 31

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte EDWARD W. MOLL

Appeal No. 2002-1635
Application No. 08/835,625

HEARD: March 16, 2004

Before BARRETT, DIXON, and GROSS, **Administrative Patent Judges**.

DIXON, **Administrative Patent Judge**.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1, 2, 4, 9, 12, 15, 17, 18, 21, 38, 40, 44, 45, 51, 55, and 67-70.

We REVERSE.,

Appellant's invention relates to a system for controlling a computer operation based on stimuli sensed corresponding to a user thought. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced below.

> 1. An apparatus for controlling a computer operation based on one or more stimuli sensed from at least one user thought, said apparatus comprising:
>
> (a) stimuli input means coupled to the user for detecting at least one stimulus being caused by the at least one thought of the user;
>
> (b) a computer having an operating system, coupled to said stimuli input means, for processing said at least one stimulus to produce a function control signal to control the operation of said computer wherein said computer does not require an articulated response from the user, said computer comprising:
>
> (1) function selection means for receiving said at least one stimulus and wherein said function selection means comprises a memory including a correspondence between a plurality of previously-stored user stimuli and a plurality of desired function control signals;
>
> (2) identification means, coupled to said function selection means, for comparing said at least one stimulus to said correspondence to identify a function control signal corresponding to said at least one stimulus, said function control signal being transmitted to the operating system of said computer.

The prior art of record relied upon by the examiner in rejecting the appealed claims is as follows:

Hartzell et al. (Hartzell)	4,949,726	Aug. 21, 1990
Adachi	5,325,133	Jun. 28, 1994
Junker	5,474,082	Dec. 12, 1995
Kuc et al. (Kuc)	5,594,849	Jan. 14, 1997

Claims 1, 55, and 67-70 stand rejected under 35 U.S.C. § 112, first paragraph as failing to provide an enabling disclosure. Claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55, and 67-70 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Junker. Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Junker in view of Kuc. Claim 18 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Junker in view of Hartzell. Claims 44 and 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Junker in view of Adachi.

Rather than reiterate the conflicting viewpoints advanced by the examiner and appellant regarding the above-noted rejections, we make reference to the examiner's final rejection (Paper No. 21, mailed Aug. 28, 2000), the examiner's answer (Paper No. 25, mailed Apr. 23, 2001) and the supplemental examiner's answer (Paper No. 27, mailed Oct. 1, 2002) for the examiner's reasoning in support of the rejections, and to appellant's brief (Paper No. 24, filed Feb. 7, 2001) for appellant's arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to appellant's specification and claims, to the applied prior art references, and to the respective positions articulated by appellant and the examiner. As a consequence of our review, we make the determinations which follow.

35 U.S.C. § 112, FIRST PARAGRAPH

Appellant argues that the declaration by the inventor Edward Moll, filed Oct. 12, 1999, evidences that detection of a particular stimulus corresponding to a particular thought was known in the art. (See brief at page 13.) In the prosecution history, we find that the examiner has only provided a brief comment at the beginning of the non-final rejection mailed Jan. 6, 2000, which states that the declaration was considered, however it did not obviate the rejection under 35 U.S.C. § 112, first paragraph. Subsequently, in the final rejection, the examiner maintained that essentially, the examiner does not dispute enablement, but that the appellant's use of the claim terminology which the examiner equates to "sensing a user's thoughts" is a "gross misnomer . . . ." (See answer at page 2.) As pointed out by our reviewing court, we must first determine the scope of the claim. "[T]he name of the game is the claim." **In re Hiniker Co.**, 150 F.3d 1362,1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998). Therefore, we look to the language of independent claim 1. The language of

independent claim 1 recites "controlling a computer operation based on one or more stimuli sensed from at least one user thought" and "stimuli input means coupled to the user for detecting at least one stimulus being caused by the at least one thought of the user." While we agree with the examiner that at first blush the claims appear to claim sensing a user's thoughts, it is clear that the system is sensing some stimuli from the thoughts and that the sensed stimuli are used to control the computer based on some stored correspondence. The examiner does not appear to dispute that this was enabled. Here, we do not find that the examiner has established a ***prima facie*** case of a lack of enablement of the invention as claimed, nor do we find that the examiner has adequately addressed the content of the evidence submitted in the form of a declaration by Edward Moll. Therefore, we will not sustain the rejection of claims 1, 55, and 67-70 under 35 U.S.C. § 112, first paragraph.

35 U.S.C. § 102

Appellant argues that Junker uses biofeedback and that Junker does not teach the "detecting the [particular] thoughts of the user" as in the present invention. (See brief at page 17.) Here, we find that Junker does use the sensing of brain activity to control a computer, but that it does not sense/detect the stimuli and compare the sensed or detected stimuli to stored stimuli to identify a corresponding control function for a computer. Appellant argues at page 17 et seq. of the brief that the function selection means and the identification means are not taught or suggested by Junker.

We agree with appellant, and do not find that the examiner has shown where or how Junker teaches these claim limitations. Therefore, we do not find that the examiner has established the initial ***prima facie*** case of anticipation, and we will not sustain the rejection of independent claims 1, 55, and 67-70 and dependent claims 4, 9, 12, 15, 17, 21, 38, 40, and 51.

35 U.S.C. § 103

With respect to dependent claims 2 (and 44 and 45)[1], appellant argues that Junker does not teach or suggest the localization of stimuli and that there is no incentive to combine Junker and Kuc (or Adachi). (See brief at pages 24-25.) We agree with appellant that the examiner has not established a convincing line of reasoning why it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the diagnostic imaging of Kuc (or imaging of Adachi) with the biofeedback control system of Junker. Nor has the examiner established how the teachings of Kuc (or Adachi) overcome the deficiencies in Junker. Therefore, we find that the examiner has not established a ***prima facie*** case of obviousness, and we will not sustain the rejection of claims 2, 44 and 45.

---

[1] While appellant has not specifically argued or combined claims 44 and 45 with claim 2, we will include these claims with claim 2 since appellant argues the lack of a teaching of localization with respect to the input device of Kuc and we imply this to also extend to the teachings of Adachi.

With respect to dependent claim 18, appellant argues that Junker does not teach or suggest the use of the computer for security or identification purposes and that Hartzell does not remedy the deficiency in Junker noted above. (See brief at pages 25-26.) We agree with appellant that the examiner has not established where Hartzell remedies the deficiency in Junker noted above. (See brief at pages 25-26.) We agree with appellant that the examiner has not established where Hartzell teaches or fairly suggests why it would have been obvious to one of ordinary skill in the art at the time of the invention to use the computer for security or identification purposes. Nor has the examiner established how the teachings of Hartzell overcome the deficiencies in Junker. Therefore, we find that the examiner has not established a ***prima facie*** case of obviousness, and we will not sustain the rejection of claim 18.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1, 55, and 67-70 under 35 U.S.C. § 112, first paragraph is reversed; the decision of the examiner to reject claims 1, 4, 9, 12, 15, 17, 21, 38, 40, 51, 55, and 67-70 under 35 U.S.C. § 102 is reversed; and the decision of the examiner to reject claims 2, 18, 44, and 45 under 35 U.S.C. § 103 is reversed.

REVERSED

LEE E. BARRETT
Administrative Patent Judge

JOSEPH L. DIXON
Administrative Patent Judge

ANITA PELLMAN GROSS
Administrative Patent Judge

) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES

JD/RWK

Appeal No. 2002-1635
Application No. 08/835,625

CAESAR RIVISE BERNSTEIN
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